LECTURES

ON THE

DISEASES

OF THE

URINARY ORGANS.

BY

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SERJEANT SURGEON TO THE QUEEN.

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ADVERTISEMENT.

I HAVE endeavored to make this edition of my Lectures on the Diseases of the Urinary Organs more worthy of being presented to the Public, by introducing into it the results of my later and more extended experience on the subjects to which they relate; and it has been the want of the leisure necessary for the accomplishment of this object that has caused the publication to be thus long delayed.

The present volume is not very much increased in size as compared with its predecessors. Nevertheless with the exception of the Lectures on Calculi of the Urinary Bladder and Lithotomy, there are few parts of it which remain such as they were formerly. Several errors are, I hope, corrected: some of the views which I had been led to entertain of disease are modified; and there is a considerable proportion of new matter. In the latter is included a Lecture on the Operation of Lithotrity, on which in the former editions of this work I did not feel myself competent to offer more than a few general observations. I have now ventured to discuss this new mode of treatment more at length, giving some practical instructions for the performance of the operation, which may probably

be acceptable to the younger members of our Profession, and to those whose minds have not yet been directed to the subject; at the same time endeavoring to assign to it what I believe to be its proper place among the appliances of surgery, and what, if I am not greatly mistaken, will be conceded to it by others, when time and experience shall have dissipated alike the prejudices of those who under-rate its importance and usefulness, and of those who hold it to be more useful than it really is.

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ON

THE DISEASES

OF THE

URINARY ORGANS.

LECTURE I.

In this and the following lectures I propose to draw your attention to the diseases affecting the urinary organs, as far as these come under the cognizance of the surgeon.

Among all the important subjects which we are required to investigate, I know of none more important than this. These diseases are always a source of great anxiety, in many instances of pain and misery, to the patient; and for the most part, if allowed to take their natural course, they terminate in his destruction. At the same time there is no class of diseases in which we are, on the whole, enabled to render those who suffer more essential service; often by removing the disease altogether; at other times by relieving the more distressing and dangerous symptoms. I shall call your attention first to the diseases of the urethra; afterwards to those of the bladder and prostate gland. My concluding observations will relate to urinary and other calculi.

On the Diseases of the Male Urethra.

The urethra of the male being long and narrow, complicated in its structure and functions, you will not be surprised to learn that it is liable to more numerous as well as to more formidable diseases than the short, wide, and simple urethra of the female. What I know of the diseases of the latter may be comprised in a few words; while those of the former will require a more lengthened investigation.

Stricture of the Male Urethra.

The canal of the urethra may be partially or completely obstructed in various ways.

Some of these causes of obstruction are to be looked for in the parts which are external to the urethra, and will be noticed in future lectures. At present I shall confine my observations to those obstructions which have their origin in the urethra itself, and to which the name of stricture of the urethra is commonly applied.

The persons most liable to be affected with this disease are those who have passed the age of puberty, but have not yet passed the middle period of life. Occasionally, however, we meet with it in children; and in a few instances it begins to exist in the latter part of life. It may sometimes be traced as the consequence of a severe or long continued attack of gonorrhœa: and it is not unusual to ascribe it to the use of irritating injections administered on account of that disease. It would seem that whatever increases the stimulating qualities of the urine, so as to make it a cause of irritation to the parts with which it comes in contact, may lay the foundation of this disease. Thus we find it where the urine deposits the lithic acid sand, where it is habitually overloaded with the lithate of ammonia, or where it is alkaline, and deposits crystals of the triple phosphate of ammonia and magnesia. In some rare instances it immediately follows mechanical injury: but this last variety of stricture presents some peculiarities, which make it worthy of being considered separately.

We find a patient laboring under a difficulty in voiding his urine. It flows in a diminished stream, and the diminution gradually increases, until at last there is no stream at all, and it escapes only in drops. If the patient dies, and we have the opportunity of examining the morbid appearances, we find some portion of the urethra contracted, and the mucous membrane, at the contracted part, thickened, and deprived of its natural elasticity. The thickening seems at first to be of the simplest kind; and we cannot explain it better than by ascribing it to an interstitial deposite of coagulated lymph (or albumen) which has been organized. If the disease has existed for many years, the contracted portion assumes a structure approaching to that of cartilage, and the parts immediately in contact with it partake of this alteration to a greater or less extent. We observe also another change as the disease advances. Instead of being confined, as it generally (though probably not always) is, in the first instance, to a small portion of the canal, the contraction extends in both directions, that is, towards the bladder and towards the external orifice, being however still more complete at the point at which it was originally established, and becoming gradually less as it recedes from it.

If we carry our researches further, we find that in the majority of instances the disease began in the anterior portion of the membranous part of the urethra, immediately behind the bulb, and in the situation of the triangular ligament of the perineum; that in some instances it had its origin in the urethra somewhere between the part just mentioned and the external orifice; and that in a few cases it is confined to the external orifice and the canal immediately adjoining to it. Occasionally, where the original and principal stricture has been in the membranous portion of the urethra, there is another stricture anterior to it;

and in cases of very long standing it is not unusual to find the greater part of the canal in a thickened and contracted state.

But here, as on most other occasions, morbid anatomy affords us but an imperfect lesson in pathology; and it is only from the observation of what happens in the living body that we can learn one of the most important circumstances in the history of this disease. While in some cases there is from day to day but little variation in the size of the stream of urine, we find in others that it varies greatly, so that a patient who one day voids his urine with so much facility that he is scarcely conscious of the existence of any impediment to his doing so, on the following day may void it only in drops, or even be unable to void it at all. This change, moreover, may take place in a very short space of time. The difficulty of micturition may almost immediately follow too copious libations of those liquors which cause the urine to be loaded with an excess of lithic acid, or lithate of ammonia; such for example as punch or champagne; and, as I shall explain more fully hereafter, it may subside even more suddenly than it took place after the pressure of a full-sized bougie against the anterior part of the structure, or the application to it of the nitrate of silver The permanent alteration in the condition of the urethra, which is disclosed to us by dissection, will not account for this phenomena; and we are compelled to refer them to some power of contraction which exists in the living body, and is wanting in the dead. A multitude of facts which you will meet with in practice can be no otherwise explained; and no one much conversant with these cases will doubt that the distinction between spasmodic and permanent stricture is well founded.

What I am about to mention seems to throw some light on this subject. Spasmodic stricture is always situated in the membranous portion of the urethra, where the canal is surrounded by a sort of sphincter muscle of no considerable size, connected by a small double tendon to the arch of the pubes. A particular description of this muscle has been given by the late Mr. Wilson, in the first volume of the Medico-Chirurgical Transactions; and it seems not unreasonable to suppose that it is the real seat of these spasmodic affections. We find nothing like spasmodic stricture in the anterior part of the canal, where there are no muscular fibres in immediate contact with it.

Instances are not wanting of persons who have been for a considerable time liable to occasional attacks of retention of urine from spasmodic stricture of the urethra, although in the intermediate periods there was no perceptible diminution of the stream of urine; and hence we are justified in the conclusion that a spasmodic stricture may exist independently of any actual organic disease. At the same time it must be acknowledged that the existence of a purely spasmodic stricture is of rare occurrence. Repeated attacks of spasmodic contraction, attended with violent efforts and straining to evacuate the contents of the bladder, cannot fail to lay the foundation of a permanent thickening of the mucous membrane; and at all events there can be no doubt that what was from the beginning a permanent stricture of the membranous portion of the urethra is always more or less liable to be affected with

spasm. Even in the oldest cases of this description, we find the patient voiding his urine one day with tolerable facility, and another day only in drops, or even suffering from a complete retention of urine in the bladder.

A stricture which affects the external orifice and anterior extremity of the urethra is, in many cases, connected with an adhesion of the inner surface of the præpuce to the glans. Such adhesion is usually the consequence of a congenital narrowness of the præpuce, combined with want of due attention on the part of the nurse to the child's cleanliness ; and hence it is that patients who labor under this kind of stricture frequently declare that they know not when the disease began, and that they cannot remember the time when the urine flowed in a full stream. The contraction thus established goes on increasing, but so gradually that it may not occasion a retention of urine, nor even any serious inconvenience, until after the middle period of life. In other cases a stricture in the anterior part of the urethra, whether situated near the orifice, or two or three inches from it, seems to be the result of a chronic inflammatory affection of the mucous membrane. There is a slight degree of pain in making water, a gleety discharge, approaching in its character more nearly to mucous than to pus, and a diminution of the stream of urine, which proceeds more rapidly than where the disease had begun in childhood, and by and bye a gristly induration may he felt through the substance of the *corpus spongiosum*, marking its exact situation, and extent of the disease. The other causes of stricture of the urethra, whether in the anterior portion of the urethra, or near the bulb, have been already noticed.

A permanent stricture of the urethra cannot exist for any long period without the urethra becoming diseased otherwise. Small irregular prominences or tubercles are sometimes found on its inner surface, which seem to consist of minute deposits of coagulated lymph, which have become organized. Occasionally a narrow membranous band is seen extending from one side of the urethra to the other, as if there had been a partial adhesion of the opposite surfaces, which had afterwards become elongated. The orifices of the mucous glands and those of the prostatic ducts are often preternaturally dilated, and indeed the whole canal of the urethra behind the stricture is widened, in consequence of the bladder forcibly impelling the urine into it, there being at the same time an insufficient outlet for its escape.

This dilatation of the urethra is most remarkable when the stricture is in the anterior part of the canal. I attended a gentleman, who for many years had labored under a stricture at the distance of three inches behind the external meatus. The posterior part of the urethra was so much dilated, that when he made water, a tumor, as large as a small orange, and offering a distinct fluctuation, presented itself in the perineum. It might be compared to a second bladder. Once, when he sent to me, laboring under a complete retention of urine, I punctured the tumor in the perineum with a lancet. Immediately the urine gushed out in a full stream. From that time it flowed regularly through the artificial opening ; all difficulty in voiding it was at an end;

and thus I was enabled to direct my whole attention to the dilatation of the stricture, which was now speedily accomplished.

In some cases of long standing, we find a gristly indurated mass at the lower portion of the penis, where it is covered by the scrotum. This is probably, in some instances, the contracted portion of the urethra, thickened and converted into a substance approaching in its character to cartilage. But in other cases it depends on a different cause, as is plain from the following history :—A gentleman who had passed many years in a hot climate, returned to England, laboring under a stricture of the urethra, and voiding his urine with great difficulty. A hard oblong tumour could be felt in the neighborhood of the stricture, though somewhat anterior to it, at the upper part of the scrotum. I dilated the structure, so as to enable the patient to introduce a bougie for himself; but still the tumor remained unaltered. He died about a year afterwards of an accidental attack of disease in the brain; and I found, on dissection, that the tumor had arisen from a deposition of lymph into the cells of the *corpus spongiosum*. Immediately behind the stricture there was an orifice, leading into a long and narrow sinus, extending from the urethra into the gristly substance of the tumor. The direction of the sinus was from behind forwards, so that it was evident that it could not have been produced by the improper use of the bougie. I conclude that it was the result of the forcible and repeated pressure of the urine against the urethra behind the stricture. The same cause, of course, was sufficient to produce the gristly induration around it.

In the foregoing observations, which have been intended chiefly to illustrate the pathology of stricture of the urethra, I have necessarily anticipated some of the observations that I have to offer respecting the symptoms by which it is indicated in the living person, and the diagnosis of the disease.

If a man under the middle period of life applies to you complaining of a difficulty of making water, the probability is that he labors under a stricture of the urethra. If an old man applies to you under the same circumstances, stating at the same time that his symptoms began several yeas ago, you may draw the same conclusion. But if he tells you that his symptoms are of later origin, you will have little reason to suspect the existence of stricture of the urethra, but great reason to believe that he labors under an enlargement of the prostate gland. Stricture of the anterior part of the urethra, for the most part proceeds very slowly; so that the patient, in some instances, scarcely notices the diminution of the stream of urine, until he is actually compelled to strain in voiding it. A complete retention of urine does not occur until a very late period of the disease; and whenever it does occur, it is scarcely ever relieved spontaneously, that is, without the assistance of art. In these cases, there is generally a slight sense of scalding as the urine flows; and a mucous or muco-purulent discharge is a frequent, but not invariable, concomitant of the other symptoms.

In cases of stricture affecting the membranous portion of the urethra, where the disease in its origin is purely spasmodic, it may be that the patient's attention is first drawn to his complaint in consequence of his being suddenly affected with a complete retention of urine, induced by some irregularity as to diet, exposure to cold, or perhaps by the application of a blister. But in another and much more common series of cases, the history is nearly as follows: —The patient voids his urine in a diminished stream. The diminution gradually increases, being sometimes attended with a slight mucous or muco-purulent discharge. By and bye there is a complete retention of urine. This subsides spontaneously, or is relieved by art. After an interval (which may vary from weeks to months, or even to years), he is overtaken by another attack of retention. During the whole of this time the stream of urine continues to become smaller; it is flattened, or otherwise altered in shape, or divided into two. At last the urine never flows in a stream larger than a thread, nor without great effort and straining. In some cases it dribbles away constantly and involuntarily, and the patient's clothes by day and his bed by night are absolutely sopped with urine, making him disgusting to himself and to all around him. This involuntary discharge of urine does not indicate an empty and contracted bladder. The bladder in fact is loaded with urine, and it is when it does not admit of further distention that the urine overflows, and all beyond a certain quantity escapes without the patient being able to prevent it, the bladder being at the same time to be felt like an enormous tumor in the lower part of the abdomen. The exceptions to this rule are very rare; and it applies not only to the involuntary flow of urine in cases of stricture, but also to that which takes place under other circumstances.

The symptoms of retention of urine are sufficiently formidable, and not the less so as they generally attack the patient suddenly. He is perhaps sitting with his friends after dinner, and feels an inclination to make water; in attempting to do so, however, he is disappointed. A second and third attempt are made after some time, and all without success. Now the case assumes a more serious aspect. An indescribable uneasiness is felt in the region of the bladder. The efforts to void the urine are no longer voluntary. The patient is compelled to strain, and the whole of the abdominal muscles are in convulsive action, instinctively endeavoring to relieve the bladder of its contents, but all to no purpose. The bladder may be felt hard, and enlarged above the pubes. The heart sympathises with the local irritation, the pulse is hard and frequent, the face flushed, the skin hot, and the tongue is covered with a white fur. The violent efforts of the patient force out a few drops of urine, which give some relief; but the kidneys go on secreting, and the relief is only temporary. In the great majority of cases, the spasm is spontaneously or artificially relieved; but there are, nevertheless, numerous examples to the contrary, in which the retention terminates in death. The bladder itself may be ruptured at the

fundus, the urine escaping into the cellular membrane, and into the cavity of the peritoneum. Such an event occurred in St. George's Hospital many years ago. The patient exclaimed, after a violent paroxysm of straining, that the bladder had burst into the belly. He died; and, on examining the body, it was ascertained that the poor fellow's words were true. This case, and another similar one, have been published by Sir Everard Home. Fortunately such cases are rare.

In most instances, the rupture is not of the bladder, but of the urethra behind the stricture. Conceive a distended bladder, and the spasmodic action of the abdominal muscles and diaphragm of a powerful man acting like a syringe and forcing the urine through the lacerated urethra into the cellular membrane. In fact the scrotum, the penis, the perineum, sometimes even the groins, are enormously distended with urine. The first effect of this mischief is to relieve the patient's sufferings. There is no more straining, and the spasm of the stricture, no longer excited by the pressure behind, becomes relaxed, so as to allow some of the urine to flow by the natural channel. After this deceptive interval of ease, another order of symptoms shows itself. The urine, under any circumstances, would irritate the parts unaccustomed to its contact; but in a case of retention of urine, it has been long in the bladder; much of its watery part has been absorbed; and it is in consequence unusually impregnated with saline matter, so that its stimulating properties are much increased. Wherever this acrid fluid penetrates, it first excites inflammation, and then kills the parts with which it is in contact. The patient is seized with shivering; the skin of the scrotum, penis, and other parts becomes red and inflamed. If you make incisions into it, you find black offensive sloughs underneath. If the incision be not made, or be not sufficiently extensive, the skin becomes speckled with black spots, which increase in size, forming large sloughs. Sometimes a black spot is seen on the glans penis: an almost fatal symptom, indicating that the whole of the *corpus spongiosum* is infiltrated with urine. As this process of mortification goes on, the constitution becomes affected, as it would have been if the mortification had arisen from any other cause. At first the pulse is full, and the skin hot; but the depressing effects of an extensive destruction of living parts are soon manifest. The heart beats feebly and frequently; then the pulse becomes irregular, and afterwards intermittent. The skin is cold and clammy; the patient is troubled with an incessant hiccough, which nothing relieves for more than a few minutes. By and bye a low delirium supervenes, which is followed by coma and death.

But the danger from the effusion of urine is not the same in all cases. In the majority the effusion takes place in front of the triangular fascia of the perineum, or else the fascia gives way, and allows the urine to pass forward to the superficial parts, instead of penetrating to the deep-seated; and under these circumstances, life may generally he preserved by the prompt interference of the surgeon.

In a very few cases, the effusion extends into the loose cellular membrane which surrounds the bladder, and the patient's case is hopeless.

The time during which a retention of urine may continue before a rupture of the urethra or bladder takes place, is much longer than you would expect. Such a catastrophe as that which I have endeavored to describe rarely occurs before the third or fourth day. It may indeed occur sooner; but often the period is even later than this. The retention may continue for a week, with occasional intermissions, during which small quantities of urine are discharged; then it may become complete, and, the urethra giving way, the urine may be extravasated. The secretion of urine may be more or less abundant; the bladder may be more or less capable of dilatation; and the period of the extravasation taking place must vary accordingly.

I am much mistaken if a stricture is not sometimes destroyed, at least in part, by ulceration. For example: I attended a gentleman who had labored under a stricture of the urethra for a great many years. He voided his urine with the greatest difficulty, the stricture being very rigid and unyielding; but I succeeded in introducing a catgut bougie, and this enabled him to make water in a small stream. Under these circumstances he was seized with pain in the act of making water, which lasted for some minutes afterwards, being referred to the situation of the stricture in the posterior part of the urethra. The pain became more severe, and the patient described it to be intolerable, saying that he could compare it to nothing but the sensations which he supposed would be produced, if melted lead had been poured into the canal. Every half hour he had a desire to make water, and his groans might be heard, not only through the whole house, but even in the street. In the course of a few days these symptoms began gradually to abate, and now it was discovered that the urine flowed in a much larger stream. When the attack had completely subsided, the condition of the patient was much improved, and he made water more easily than he had done for many years. I know not how all these circumstances can be so well explained, as on the supposition of the stricture having been in a state of ulceration.

Such a case is rare; but what I am about to describe is common enough. The patient complains of more than usual difficulty in voiding his urine; but the difficulty does not amount, at least in the first instance, to an absolute retention. Perhaps he has a shivering. There is a sense of fullness in the perineum, and some degree of deep-seated induration is perceptible in one part. This gradually increases, and a tumor presents itself under the skin of the perineum, surrounded with more or less of œdematous effusion, especially into the scrotum. The skin becomes inflamed, and the fluctuation of fluid is perceptible underneath. An abcess bursts, or is opened with a lancet, and a considerable quantity of putrid pus is discharged. Here the œdema of the neighboring parts subsides. Pus continues to flow through the orifice of the abscess, and after some time it is observed that urine flows through it also. The discharge of pus diminishes, but the urine flows in larger quantity; and whenever the patient makes

water, part escapes through the natural channel, and part by the new opening. The abscess has evidently a communication with the urethra behind the stricture. If you have an opportunity of dissecting the diseased parts while the abscess is recent, you find it to open into the urethra by a ragged irregular orifice. If you examine them at a later period, the orifice in the urethra is found to be smooth, regular, and rounded at the margin; the external orifice in the perineum is reduced to a narrow diameter, and is seen in the center of a button-like projection of the skin; and the abcess itself is contracted, perhaps reduced to a narrow passage, with a smooth surface, which presents somewhat of the appearance of it being lined by a mucous membrane. We now say that the case is one of *fistula in perineo*. The whole of these phænomena are easily explained. The urethra, constantly teazed by the pressure of the urine against it, ulcerates behind the stricture. If the stricture had been completely closed, as in the case of retention of the urine, an extensive extravasation of urine would have immediately taken place; but under the existing circumstances, this does not happen, and only a moderate quantity, perhaps not more than a few drops, dribbles into the cellular membrane, sufficient to induce inflammation and suppuration, and no further local mischief. A *fistula in ano* is formed in the same manner, by ulceration of the rectum, allowing the escape of a minute quantity of fæculent matter into the neighboring textures.

The formation of the abscess in the perineum is always attended with some degree of fever. but sometimes the febrile symptoms are very urgent: the skin is hot, the pulse rapid, the tongue dry and brown, or covered with a black crust. If the abscess be left to burst of itself, it is more than probable that the patient will perish under these typhoid symptoms; if it be opened, a dark-colored offensive putrid pus is discharged, the bad qualities of which are manifestly owing to an admixture of urine. If the operation be not imprudently deferred, an immediate improvement follows the opening of the abscess; the pulse becomes less frequent, the skin less hot, the tongue clean and moist, and the patient, who appeared to be on the verge of death, is restored to life, and comparatively to health.

I have described the simplest form of the urinary abscess. But it is often more complicated. It is not always confined to the perineum. Sometimes it makes its way forward through the upper part of the scrotum, and presents itself on the lower part of the penis, between the scrotum and the glans. At other times it burrows in the opposite direction, forming a large collection of matter in the nates, or it may burst in the groin or in the scrotum. In one case, in which I had the opportunity of examining the body after death, I found a large abscess in front of the pubes, extending half way towards the navel; another among the adductor muscles of the left thigh; and a third among the muscles at the upper part of the right thigh, as far outwards as the *foramen ovale* of the ischium; the periosteum having been destroyed, and the bone itself rendered carious to a considerable extent: and all these abscesses could be traced into an

abscess in the perineum, communicating with the urethra behind a stricture by a small orifice. In another case which I attended with Mr. Samuel Cooper, there was a *fistula in perineo*, communicating with a large abscess of the pelvis on one side of the bladder.

I have seen a few cases in which an abscess of this kind had made its way into the rectum, forming a fistulous communication between it and the urethra. If such communication be of a large size, it is a source of great distress, as fæculent matter occasionally passes through it from the rectum into the urethra. If it be small, however, the absolute inconvenience is trifling, and the patient is rendered sensible of its existence only in consequence of a small quantity of air escaping occasionally by the urethra: and this may continue, without any further symptoms supervening, for many years.

There is one form of abscess of the perineum, which may be compared to what has been called a *blind fistula of the rectum;* the abscess having an opening into the urethra and none externally. Such an abscess may at one time be inflamed, swollen, and tender; then these symptoms may subside, but only to recur at a future period; and this state of things may continue for many years. I conclude that in these cases the abscess is formed in the usual way, by ulceration of the urethra, and the infiltration of a small quantity of urine into the cellular texture; but that, when a certain quantity of matter is collected in it, it bursts into the urethra, instead of finding its way to the surface, the communication being of sufficient size to prevent any considerable accumulation of matter afterwards.

A fistula of this description is a source of inconvenience and mischief, and of nothing else. It is not so with a fistula which has an external opening. The latter answers, in some measure, the purpose of a safety-valve to the bladder, enabling the patient to void his urine even where the stricture is closed, and lessening the liability to retention. But even in this case the good is not unmixed with evil. It occasionally happens that the external orifice of the fistula becomes inflamed and swollen, or that it actually heals, and that this is followed by an accumulation of matter within, attended with many, or with the whole of the symptoms which marked the first attack of the disease. And there may be even greater mischief ultimately. Mr. Vincent and myself attended a gentleman with a *fistula in perineo*, which he had neglected for many years. At last he observed that the callosity at the margin of the fistula had begun to increase; and it went on increasing, so that it ultimately extended to the scrotum and penis. When we were called in, we found him with a malignant tumor, affecting the perineum, scrotum and penis, which had evidently had its origin in the fistula. He ultimately died in great distress and misery.

LECTURE II.

Stricture of the Urethra—continued.

If you consider the relations which the urethra bears to the prostate gland and bladder, you will not wonder that these organs should suffer in old and inveterate cases of stricture.

A chronic enlargement of the prostate gland is one of the most frequent changes with which the body is affected in old age; and it may take place in those who labor under stricture of the urethra as well as in other persons. There is, however, more than this merely accidental connection of the two diseases with each other; and those who have been long tormented with stricture are more liable to disease of the prostate, and are liable to it at an earlier period of life, than those in whom the urethra is free from obstruction. In a great number of instances, where the patient is somewhat advanced in years, when you have dilated the stricture, you find that the relief is incomplete, and remedies beyond those which the stricture itself demands are necessary to remove or palliate the symptoms produced by the disease of the prostate. I have already mentioned the dilatation of the ducts of the prostate, which is observed in some cases. Occasionally, where the urethra has been diseased for a long period, pus may be squeezed out of the dilated ducts. Circumscribed abscesses also form in the substance of the prostate, which, in some instances, burst and discharge their contents by the urethra, during the patient's lifetime; while in others their existence is not ascertained until an incision is made into the diseased gland in the examination of the body after death. It is not my intention at present to enter into the history of the additional symptoms which arise from this complication of disease of the prostate in old cases of stricture, since they do not materially differ from what we observe where the prostate is alone affected; to which subject I shall call your attention in a future lecture. The following observations, however, may be introduced now better than hereafter:—

1. Where a simple chronic enlargement of the prostate gland supervenes on stricture of the urethra, the latter usually becomes less liable to spasm, and is more easily dilated, and altogether more tractable than it was before: a change in its condition which is easily explained; as the pressure of the urine against the stricture when the patient strains in making water is a constant source of irritation, which is in a great measure removed as soon as a new impediment to the flow of the urine between the stricture and the bladder, is established by the tumor of the prostate.

2. But where the disease of the prostate goes beyond the mere enlargement, and suppuration has taken place in its substance, an opposite effect is produced on the stricture; the abscess itself becoming

a source of irritation, rendering the stricture more sensitive, and more liable to spasm than it would have been otherwise.

3. Although the combination of stricture with enlarged prostate is common enough, it is not so common as it is by some surgeons supposed to be. An old man, who has a frequent desire to void his urine, and voids it slowly and with difficulty, applies to a surgeon whose hand is light and accustomed to the use of the catheter. The instrument is then introduced readily, or, at any rate meets with no obstruction until it reaches the neck of the bladder, and the case is set down as one of enlarged prostate, which it really is. Another old man, under precisely similar circumstances, applies to a surgeon who uses the catheter rudely and incautiously. The urethra resents this rough usage; spasm is induced, and the point of the catheter cannot be passed further than the membranous part of the urethra. The case is then supposed to be one of stricture, and is treated as such: I need not tell you to how little purpose.

I have already mentioned that the bladder is rendered irritable in many cases of stricture of the urethra. In consequence of this, it is never properly dilated, and it becomes small and contracted. If the stricture be dilated before any further disease in the bladder is established, the latter is relieved, and soon regains its natural capacity. In many cases of old and neglected stricture, the mucous membrane of the bladder becomes affected with chronic inflammation. It secretes a ropy adhesive mucus, which clings to the bottom of the vessel which receives it; and sometimes this mucus is generated in such abundance as to obstruct the narrow orifice of the stricture, and add very much to the difficulty of making water. In such cases, if you examine the body after death, you find the vessels of the mucous membrane turgid with blood, and the whole membrane in consequence of a dark red color: and things may continue in this state, sometimes better and sometimes worse, for months, and even for some years.

I have met with several cases of stricture of the urethra in which the mucous membrane of the bladder was found, after death, not only inflamed, but encrusted, even over a large portion of its surface, with coagulated lymph. Such an effusion of lymph is the result of acute inflammation, differing in its character from the chronic inflammation, which produces merely a secretion of the vesical mucus; and it is observed chiefly (if not exclusively) when the patient has died after having been harrassed by repeated attacks of retention of urine.

There are other cases in which the bladder, instead of being contracted, is rendered more capacious than natural; the patient never emptying it completely. I have already explained that this condition of the bladder is often indicated by an involuntary discharge, or incontinence of urine. Here, when you have dilated the stricture, the symptoms are only partially relieved; and on introducing the catheter, you find a large accumulation of urine, which the patient was unable to void by his natural efforts. This particular symptom may occur where the stricture exists in combination with enlargement of the

prostrate; but it occurs also in old cases of stricture, independently of this complication.

In most cases of stricture, the muscular coat of the bladder is thicker and stronger than natural. This circumstance is easily explained. The bladder has been called on to make unusual exertions, and it is a law of the animal economy, that muscles which are unusually exercised shall become increased in bulk.

In some instances, the mucous membrane is protruded through some of the interstices of the muscular fibres, forming numerous small cysts, communicating with the cavity of the bladder. These cysts appear to be produced in the following manner:—when the patient strains in making water, the mucous membrane, while it is pressed on by the muscular fibres externally, has to sustain an equivalent degree of pressure on its inner surface from the reaction of the urine. Wherever there happens to exist a small interstice between the muscular fibres, the latter force alone operates, and the bulging outwards of the mucous membrane is the necessary consequence. These cysts, however, are not peculiar to cases of stricture of the urethra, and they occur equally where the obstruction to the flow of urine arises from an enlargement of the prostate gland, or from any other cause. A cyst being once established, continues to increase, and may ultimately attain a very large size. Many years ago I met with a case of long-neglected stricture of the urethra, in which, on examining the body after death, I found one of these cysts, interposed between the bladder and the rectum, at least equal in capacity to the bladder itself. Occasionally, as I shall explan to you more fully in a future lecture, a calculus finds its way into one of these cysts, increases in size, and becomes impacted in it. For the most part the contents of the cysts are similar to those of the bladder itself; but I shall have occasion hereafter to mention a case in which a large cyst of this description contained pure pus, while in the bladder there was nothing but urine.

In cases of stricture, where the disease has existed for many years, and nothing effectual has been done for its relief, abscesses form in the cellular membrane external to the bladder, but communicating with it, similar to those which I have already described as connected with the urethra. A considerable time elapses before such abscesses present themselves externally. They point at last in the groin, or above the pubes, discharging a putrid offensive pus in the first instance, and giving exit to urine afterwards. In Dr. Hunter's Museum (which is now in Glasgow,) there is a preparation exhibiting an abscess of this kind communicating with the bladder at the fundus, extending upwards in the course of the urachus, and opening externally at the navel. I believe that the formation of these abscesses is always preceded by chronic inflammation of the mucous membrane of the bladder, and their existence is marked by severe typhoid symptoms. For the most part they may be regarded as a sign of approaching dissolution.

Stricture of the urethra, as it impedes the flow of urine from the bladder, so it cannot but interfere, to a certain extent, with the passage

of urine into it. One result of this is, that the ureters, pelves of the kidneys, and infundibula become dilated, the glandular structure absorbed, and the whole organ converted into a membranous bag, divided by septa into different compartments, which, however, communicate with each other. The kidneys are also liable to be affected in other ways; but, to avoid a needless repetition, I may refer you for what I have to say on this subject to future lectures, especially to that on the diseases of the prostate gland.

I have said that rigors sometimes occur during the formation of urinary abscesses. In this there is nothing remarkable, as rigors mark the existence of suppuration under a variety of other circumstances. But rigors also occur in many cases of stricture independently of abscess. We meet with them most frequently in patients from hot climates. They usually recur at irregular periods, being in many instances brought on by the introduction of a bougie, or the application of caustic to a stricture. The paroxysm very nearly resembles that of an intermittent fever, and it is more severe when it follows the use of a bougie than when it occurs independently of it. In general, the cold fit having been followed by a hot fit, and that by a profuse perspiration, the patient is relieved. At other times, however, the constitution is disturbed by a great length of time afterwards; and sometimes the rigor is followed by an attack of continued fever, which lasts for some days, or even for some weeks. I met with a case in which a rigor followed the application of caustic to a stricture, and this was followed by an attack of mania, which (if my recollection be accurate) did not subside for nearly a month. Another patient had laboured under a stricture of the urethra for many years, during which no instrument had ever been made to enter the bladder. I succeeded in introducing a small gum catheter. Having emptied the bladder, I removed the catheter. In a few hours afterwards there was a severe rigor. An attack of fever ensued, attended with rheumatic inflammation of the muscles of the neck, from the effect of which the patient never entirely recovered, though he lived for many years afterwards.

It has been said that stricture of the urethra lays the foundation of disease of the testicle The introduction of a bougie will sometimes induce acute inflammation of that organ, probably by irritating the *verumontanum* and the office of the *vas deferens;* and it is not improbable that chronic inflammation of the testicle may sometimes arise in the same manner. It appears to me, however, that the effects of a stricture on the testicle have been, by some writers, very much exaggerated. An hospital surgeon, who is now no more, published a work in which he expressed himself as if he regarded almost all cases of chronic inflammation of the testicle as being dependent on disease of the urethra, and not curable, except under the use of the bougies. I need make no comment on such a fantastic hypothesis.

Diagnosis in Cases of Stricture of the Urethra

I shall now suppose that a patient applies to you, believing that he has a stricture of the urethra. Perhaps you find on inquiry that the symptoms are equivocal; and you require something more than a mere knowledge of them to enable you to determine whether a stricture does or does not exist: or it may be that the symptoms are so distinct and well marked that you can have no doubt as to the existence of a stricture, but you wish to know in what part of the urethra it is situated, and what is the degree of contraction. The knowledge that is required in either of these cases, is to be obtained by the examination of the urethra with a bougie, or some other instrument corresponding to it.

The best kind of bougie is that in common use, made of plaster spread on linen, and rolled up. It should be smooth on the surface, and neatly rounded at the extremity. The plaster bougie should be rubbed until it becomes warm, so that it may be moulded by the hand, and bent into the form of the urethra. Thus bent, it is much to be preferred to the elastic bougie, which is made of elastic gum on the outside and of catgut within. The latter may, it is true, be bent into any form; but it is elastic, and however you may bend it, it always regains its straight figure, and hence it is not well constructed for being passed along the curved canal of the urethra. The bougie which is used for the purpose of examining the urethra should be of a full size, that is, large enough to fill the urethra without stretching it. A small bougie may deceive you in two ways: it may pass through a stricture, and thus lead you to believe that there is no stricture, when there really is one; or it may have its point entangled in the orifice of one of the mucous follicles of the urethra, or in some accidental irregularity of the canal, and lead you into the opposite mistake of supposing that there is a stricture where none exists. If you use a bougie of the size of the urethra, you are not at all liable to the first error, and you are much less liable to the second than you would be otherwise. The bougie should be cylindrical. There is no advantage in any bougie, except a very small one, being conical. A conical bougie, becoming larger towards the point, which is held in the hand, is likely to extend forcibly the orifice of the urethra, and to excite inflammation in it.

The existence of stricture in the anterior part of the urethra, or at its orifice, is so easily ascertained, that it seems unnecessary to offer any observations on the subject. The following rules, then, are to be considered as relating especially to those cases in which it is a question whether there be, or be not, a stricture in the membranous part of the urethra, or its immediate vicinity.

I generally find it best to introduce the bougie with the patient in the erect posture, keeping the extremity of it, which I hold in my right hand close to his groin, and passing it until it will go no further in that direction; after which, by turning the instrument, I bring it hori-

zontally forwards, and push it gently towards the bladder. If the patient has well-marked symptoms of stricture, and the bougie meets with an obstruction in some part of the urethra, you may be justified in considering this as sufficient to indicate the existence and situation of the disease. If, however, the patient has no such well-marked symptoms, you should not advance at once to the conclusion that there is a stricture because the bougie does not immediately enter the bladder. The extremity even of a large bougie may hitch in some irregularity of the mucous membrane; or if you are at all rough in the use of it, a spasm may be induced in the membranous part of the urethra, or in the muscle which surrounds it, preventing the bougie from being passed, although no such cause of obstruction exists at other times. Under these circumstances, you should introduce a silver catheter, or, what is better, a metallic sound, having a moderate curvature, and warmed to the temperature of the body; and it is probable that, if there be no stricture, the metallic instrument will be easily introduced, although the plaster bougie could not be introduced at all. In short, where there are no decided symptoms of stricture you ought not to adopt the opinion that a stricture exists, without having made a very careful examination of the urethra. Inattention to this rule has led to many patients being subjected to a course of treatment for stricture who had never labored under the disease.

There is a fashion in diseases, or rather, (to speak more properly) there is a fashion in the opinions entertained as to the prevalence of particular diseases, and when the attention of the medical profession and the public has been especially directed to a certain order of cases, such cases are almost invariably supposed to be much more common than they really are. A very few years ago it was so with respect to the disease which we have now under consideration. If a man had a troublesome gleet; if he had an indurated testicle; if he had a priapism at night; if he had a frequent inclination to void his urine; if he was impotent, or believed himself to be impotent; if the stream of urine was not perfectly cylindrical; or even if he was liable to an herpatic eruption on the prepuce; he was supposed by many surgeons to be laboring under stricture of the urethra, and was at once subjected to the unnecessary use of bougies. The number of persons who at this period were supposed to have a stricture of the urethra, and who really had no such disease, and many of whom had no disease at all, was not less than that of the young females who, at a still later period, have been the victims of another mischievous delusion, being laid up for years together on a sofa, under the supposition that they labored under disease of the spine or hip, when in reality they suffered only from hysterical pains and spasms, which air and exercise would have cured, but which confinement and nursing, and the attendance of physicians and surgeons, have only tended to aggravate. I dwell on this subject, because I am anxious that none of my pupils should fall into an error so discreditable to themselves, and so mischievous to society.

Treatment of a Retention of Urine from Stricture.

It frequently happens that when you are first called to a patient with a stricture of the urethra it is on account of his laboring under a retention of urine in the bladder. At all events, this, when it does occur, demands your first attention. Here the patient is in a state of immediate danger; and you are to stand between him and destruction. You have no time to pause, to deliberate, or to consult your friends or your books. Your patient is suffering torture; he and his friends are in a state of the greatest possible anxiety and alarm; and it is important that you should have a perfect knowledge of all the remedies which are likely to be useful, so that you may be enabled to make an immediate application of them for his relief.

You will observe that the causes of retention of urine are various. Stricture of the urethra is only one of them. The treatment which is applicable to a retention from one cause is not applicable to a retention from others. The observations which I am about to make relate exclusively to cases of retention from stricture: but even in these cases the immediate cause of the inability to void the urine is not always the same.

I have explained how it is that abscess is formed in the perineum Here, in the first instance, there has been no absolute retention of urine. If there had been, instead of an abscess, there would have been an extensive extravasation of urine into the cellular membrane. But when an abscess is once formed in the neighborhood of the urethra, and has attained a certain magnitude, it cannot fail to obstruct that canal, and, though not the consequence, may itself become a cause of retention of urine. This is especially liable to happen where the matter is pent up behind the deep-seated fascia of the perineum. To relieve the retention you must open the abscess. For what I have to say further on this subject, I may refer you to my next lecture.

A stricture at the external orifice, or in the anterior part of the urethra, is a much less frequent cause of retention of urine than a stricture which is situated at the membranous part. Here the stricture is not liable to spasm, and you can look only to its mechanical dilatation.

A small catgut bougie may generally be introduced into it. This may be followed by one of a larger size, and thus again by a straight metallic instrument larger still. This will enable the patient to void a portion, but not the whole, of his urine. The bougie or metallic sound must then be introduced again, and allowed to remain in the stricture until there is another impulse to make water, and this process must be repeated until the bladder is emptied.

But in the very great majority of cases the immediate cause of a retention of urine is a spasmodic affection of a stricture at the membranous part of the urethra; and it is to this class of cases that the observation which I have now to offer will especially relate.

I have heard it recommended, even by some experienced surgeons,

that in these cases you should bleed your patient, that you should direct him to be put into a warm bath, and that certain other means should be employed, before you attempt to relieve him by the introduction of a bougie or catheter. But this recommendation does not correspond with what my own experience would suggest. The cause of the retention is local, and in the greater number of cases you will succeed in enabling the patient to empty the bladder by mechanical means. The plan which I would recommend you to adopt is the following:—

Begin by taking one of the smallest gum catheters, which has been kept for a considerable time on a curved iron wire, and which retains the curved form after the wire is withdrawn. Introduce it without the wire; and, as it approaches the stricture, turn the concavity of the catheter towards the pubes, elongating the penis at the same time by drawing it out as much as possible. It is not very improbable that it will pass through the stricture, and enter the bladder. The urine will then flow through it in a fine stream, and the patient will obtain immediate and complete relief.

If you fail with the small gum catheter, try, not a plaster, but a small catgut bougie. Let this be well made; that is, firmly twisted, nicely rounded at the extremity, and every where well polished. Observe the same rule of elongating the urethra, and it will probably enter the stricture. It is not necessary that the catgut bougie should pass on to the bladder; it is sufficient if the stricture grasps, or holds it. Let it remain in the stricture until there is a violent impulse to make water. Then withdraw the bougie, and the urine will follow it in a small stream. If the patient empties the bladder, the object is attained; but, otherwise, re-introduce the catgut bougie, or rather introduce another of the same size (for a catgut bougie which has been once used is not fit to be employed a second time); and let the patient retain this second bougie as long as he can. If the straight catgut bougie cannot be passed, you will often succeed in effecting its introduction by bending the point of it thus:—

This contrivance enables you to keep the point sliding against the upper surface of the urethra, avoiding the lower part, in which the obstruction is always most perceptible, in which the bougie is most likely to become, as it were, entangled.

Even where you have failed to relieve the patient by means of the catgut bougie, you will often succeed in introducing a silver catheter, or an elastic gum catheter mounted on a firm iron stilet, into the bladder. The catheter employed on this occasion, if the stricture be of recent formation, should be nearly of the full size of the urethra; but

if the stricture has been of long duration, it should be considerably smaller. The common silver catheter is not so well adapted for the purpose as that which I now show you. You will observe that it is shorter and less curved than usual; and that it is fixed in a wooden handle, which renders the instrument more manageable than it would be otherwise. If you use an elastic gum catheter, the iron stilet should have a flattened handle, resembling that of a common sound. You should pass it as far as the obstruction, and having acertained where it is situated, withdraw the catheter a little, a quarter of an inch for example, and then, as you pass it on again towards the bladder, keep the point sliding against the upper part of the urethra, which is towards the pubes, avoiding the lower part, which is, of course, towards the perineum. Be careful to employ no violence. If you lacerate the urethra, so as to cause hæmorrhage, you will be defeated in your object. Press the catheter firmly, but gently and steadily against the stricture, keeping in your mind the anatomical position of the parts, and being careful to give the point of the instrument a right direction. When the pressure has been thus carefully continued for some time, the stricture will begin to relax. It will allow the point of the catheter to enter, and, at last, to pass completely through it into the bladder. In some instances this will be accomplished in the space of one or two minutes; while in others it may be necessary to persevere for a quarter of an hour. As soon as the catheter has reached the bladder, the patient's sufferings are at an end, as the bladder becomes completely emptied. If you have used the elastic gum catheter, it may be prudent to allow it to remain in the urethra and bladder for one or two days, or even for a longer period; and this will go far towards accomplishing the cure of the stricture.

If you are skilful and prudent in the management of the catheter, you will generally succeed in introducing it into the bladder; but if you fail in doing so, the attempt to introduce it may still be useful to the patient. The pressure of the catheter against the stricture, if kept up for a considerable time, exhausts the morbid irritability of this diseased portion of the urethra. The spasm becomes in a considerable degree relaxed, and if you withdraw the instrument when the patient has a violent impulse to make water, the urine will follow in a stream. Observe, that I am taking it for granted that you are careful to avoid all violence. If the membrane of the urethra be lacerated, the probability is, that the spasm will not give way; and if, under these circumstances, you persevere in the attempt to introduce the catheter, you will but aggravate the evil which it is your object to remove.

The remedy on which you are most to rely, where these mechanical means fail, is opium. From half a dram to a dram of laudanum may be given as a clyster in two or three ounces of thin starch. If this should not succeed, give opium by the mouth, and repeat the dose, if necessary, every hour until the patient can make water. According to my experience, the cases in which the stricture does not become relaxed under the use of opium, if administered freely, are very rare. The first effect of the opium is to diminish the distress

which the patient experiences from the distention of the bladder. Then the impulse to make water becomes less urgent; the paroxysms of straining are less severe and less frequent; and after the patient has been in this state of comparative ease for a short time, he begins to void his urine, at first in small, but afterwards in larger quantities.

It is customary in these cases, to employ the warm bath. It is, indeed, sometimes useful, but you can place no dependence on it as compared with opium. It is not sufficient that your patient should sit in a hip bath: the bath, to be at all efficient, must be complete; his whole person ought, therefore, to be immersed, and he should remain in it for half an hour, or an hour, or longer, unless he previously becomes faint. Bleeding from the arm is seldom required in cases of retention of urine from stricture; but, in some instances, even where other means have failed, taking blood from the perineum by cupping gives immediate relief.

Purgatives require some time to produce their effect, and, in most cases, at the period of your being called in, the symptoms are too urgent to admit of this delay. Where, however, a stricture is chiefly spasmodic, and the retention follows the too great use of fermented liquor or spirits, I would advise you, if you are sent for on the commencement of the attack, to prescribe a draught of infusion of senna with the tartrate of potass and tincture of jalap. As soon as this has fully operated, and the bowels are emptied, give thirty or forty drops of tincture of opium by the mouth, or order an opiate clyster to be administered, and, in all probability, the attack will subside.

After all, there is no absolute rule as to the treatment of retention of urine from stricture. One person is relieved in one way, another in another; and you will do well in each case to bear in mind the particular mode of treatment which has proved of service, in order that you may at once resort to it, if you are called a second time to the same patient, under the same circumstances. In one instance, you will be able to pass a catgut bougie, and not a catheter; in another, you will be able to pass a catheter, and not a catgut bougie. One individual is relieved by opium, another by the warm bath. A gentleman of my acquaintance, who was subject to attacks of this description for a considerable time, almost always began to make water after a pint of warm water had been thrown up as a clyster. To show what various treatment is necessary, I have been in the habit of mentioning the following case. A gentleman, who had been long in hot climates, labored under an old stricture of the urethra. He was able to pass a bougie for himself; and he did this at regular periods, and for a long time experienced little or no inconvenience from his disorder. One night, however, he was seized with retention of urine, and called me out of my bed in consequence. I introduced a gum catheter, which entered the bladder with perfect ease, and drew off the urine. He called me up another night, and another, and another still; and one night he called me up twice. At last, it occurred to me that he always sent for me on the alternate nights; and on inquiry, I found that the attack of retention regularly came on about twelve o'clock, and even though the catheter had entered the bladder, the spasm did not relax,

so as to enable him to make water by his own efforts, until five or six in the morning. I determined then to treat the case as we do many other intermitting and periodical diseases; and I prescribed him the sulphate of quinine. The first night after he began to take it he had an attack of retention; but he had no attack afterwards.

Now let us suppose a case in which you have tried all the methods which I have described to no purpose. The bladder becomes more and more distended, the patient's sufferings go on from bad to worse. Are you to leave him to suffer and die? By no means. You may puncture the bladder itself, or you may make an opening into the urethra, behind the stricture, and thus prevent the catastrophe which would be otherwise inevitable.

Four different operations have been proposed for the purpose of drawing off the urine, when it cannot be voided by the natural passage. The bladder may be punctured above the pubes, or from the rectum, or from the perineum; or the urethra itself may be punctured between the stricture and the prostate.

It is not my intention at present to enter into a detailed history of each of these operations; but I shall nevertheless offer a few observations respecting them. You may prefer one operation to the other; but you will not be able in practice to resort to one exclusively. Your choice must be influenced by the particular circumstances of each individual case. If the patient be thin, and the bladder be much distended, you may puncture it above the pubes; but if the patient be corpulent, this operation will be difficult; and if the bladder be contracted, it will be impracticable. If the bladder be much distended, and the prostate gland be of its natural size, you may puncture it from the rectum; but if the distention be inconsiderable, or the prostate gland be enlarged, this operation will be at the same time difficult and dangerous. The puncture of the bladder from the perineum is so serious and severe an operation, and attended with so great a chance of mischief, from the effusion of urine into the loose cellular texture, that no surgeon of the present day, as far as I know, ventures to recommend it. The puncture of the urethra from the perineum in thin persons, where the parts to be divided are not altered from their natural structure, is a sufficiently simple and unobjectionable operation. The staff introduced into the urethra shows the situation of the stricture. The membranous portion of the urethra is situated behind the stricture, and below the symphysis of the pubes; and the bulging of the urethra, as the urine is driven into it when the patient strains, points out the exact spot at which it may be opened. But it may be that the patient is a fat person, with a deep perineum; or that the parts in the vicinity of the stricture are in a state of gristly induration; or that the perineum has been at a former period the seat of abscesses and sinuses; or that such sinuses exist at the present moment: and any one of these circumstances will be sufficient to make the operation perplexing and difficult even to the best anatomist. On the whole, from what experience I have had on the subject, I am inclined to believe that the puncture of the bladder from the rectum is applicable to a greater num-

ber of cases than any other operation. In proper cases this operation is free from pain and danger, and it has the advantage of simplicity, being performed at once without difficulty. The trocar having been withdrawn, the canula should be allowed to remain in the rectum and bladder for one or two days. By the time that it is removed, the sides of the wound will have become agglutinated, and it may perhaps continue as a fistulous communication between the bladder and rectum until the stricture is cured. At least this happened in one instance; and thus I was enabled to cure one of the most distressing cases of stricture which I ever had under my care. The patient was a middle-aged gentleman, who had labored under the disease from his boyhood. The use of the bougie induced a secretion of ropy mucus in such quantity as to fill up the urethra, and to be in itself a material impediment to the passage of the urine, and not unfrequently it occasioned a complete obstruction of the urethra, and a retention of urine. In one of these attacks of retention, I punctured the bladder from the rectum, and the wound, as I have mentioned, became fistulous. Now, whenever the stricture was more close than usual, the bladder was relieved through the fistulous passage, and the urine came away by the rectum. The secretion of the ropy mucus ceased: there was no recurrence of the retention of urine. Nothing now interfered with the necessary operations on the urethra, and the dilatation of the stricture was easily accomplished.

It may be further observed respecting this operation of puncturing the bladder, that it is impossible to lay down any general rule as to the period beyond which it ought not to be delayed. You must exercise your own judgment, taking into consideration all the circumstances of the particular case before you. Sometimes there will be no reason for resorting to it until after the lapse of three or four days; and at other times it ought to be performed within thirty-six hours, or even sooner.

After all, however necessary it may be to the safety of the patient in some instances, it is an operation that is very rarely required. Surgeons who see a great number of cases of retention of urine, may, in the course of their lives, be called on to perform it in a *few* instances. Those who perform it frequently, must often perform it unnecessarily; at least this is what I should say, judging from my own experience.

Where the urethra has given way behind the stricture, and the urine has become effused into the cellular texture, very prompt and vigorous measures are necessary: delay is fatal. I remember the time when five out of six of those patients, in whom this mischief took place, perished; but now, from the more active treatment employed, under the hands of a well-informed surgeon the great majority recover.

I have already mentioned, that the escape of the urine is followed by a relaxation of the stricture. You will probably, now be able to introduce a catgut, or some other bougie (a catgut is to be preferred) through the stricture into the bladder. If you can do so, it is so much the better. Introduce the bougie; let the patient be

held in the position in which you would place him for lithotomy; make an incision in the perineum; feel for the catgut bougie, make an incision on it, and, of course, you make an opening in the urethra. Through this opening, the catgut bougie serving you as a director, introduce a short gum catheter from the wound in the perineum into the bladder. You will generally find, although the effusion of urine has taken place, that there is still a large quantity of urine left in the bladder. Of course it is drawn off by the catheter, and the bladder is emptied. Allow the catheter, however, to remain in the wound and in the bladder. Then make extensive scarifications or incisions through the skin, wherever the urine has been effused underneath, and let these incisions extend to the sloughs of the cellular membrane. Apply a poultice: let the parts be fomented twice or three times daily. After one or two days, you may remove the short gum catheter, which, in the meantime has kept the bladder empty. Your treatment of the patient, in other respects, must depend on his symptoms and general condition At first, it is often right merely to give some saline medicine, with small doses of Dover's powder every six or eight hours: afterwards it will be proper to exhibit wine, ammonia, opium, and, perhaps, bark, or the sulphate of quinine: in other cases opium, cordials, and tonics will be required in the beginning. As soon as the sloughs begin to separate, remove them with a pair of forceps, and dress the sores according to circumstances.

In those cases of effusion of urine in which you are unable to pass an instrument into the bladder, you must be contented (as to the local treatment) with making a free incision in the perineum, and extensive scarifications in the neighborhood. Here the patient labors under a disadvantage, in consequence of the bladder remaining loaded with urine; but nevertheless, if the scarifications are made at an early period, he usually recovers.

LECTURE III.

On the Cure of Stricture of the Male Urethra.

A STRICTURE at the orifice may be dilated by means of a common bougie, or a short metallic instrument; the size of the bougie being gradually increased, and the introduction being repeated daily or on the alternate days, according to circumstances. The process of dilatation is, however, in many instances, attended with much inconvenience to the patient. In those cases, especially, in which the contraction began in early life, every introduction of the bougie causes considerable pain; at the same time that the disposition to contract is so great that the operation requires to be repeated almost daily The consequence is, that the part is kept in a constant

state of inflammation, and, between the disease and the remedy, is a source of constant annoyance to the patient. Under these circumstances another mode of treatment may be had recourse to, as in the case which I am about to mention.

A gentleman, thirty years of age, consulted me on account of a difficulty of making water, under which he had labored since he was a child. The difficulty had increased by slow and almost imperceptible degrees, until at last, about fourteen months before he applied to me, he had a complete retention of urine. A surgeon, whom he then consulted, found the obstruction to be confined to the orifice, and that part of the urethra which is surrounded by the glans; and he relieved him without difficulty by means of a short and small bougie. This relief, however, was only temporary, and it was found necessary to have recourse to the use of the bougie almost daily; and even then the patient was not able to void his urine without considerable difficulty. An attempt was therefore made to dilate the orifice further by means of larger bougies. But that treatment was productive of considerable inconvenience, and when the patient was under my care, the orifice of the urethra was tender and inflamed; the mucous membrane immediately within it seemed to be in a state of ulceration; and not only the insertion of the bougie, but the contact of the urine always occasioned no trifling degree of pain.

It was evident that something more must, if possible, be done for the patient's relief; and accordingly, I determined at once to divide the contracted part of the urethra. This was easily accomplished by means of a pair of knife-edged scissars, one blade with a blunt point being introduced into the urethra, and the division being made in the situation of the frænum. No hæmorrhage followed the operation. A piece of lint was kept between the cut surfaces to prevent their re-union, and in about ten days they were cicatrized, being covered by what had already assumed a good deal of the appearance of a mucous membrane.

Strictures in the anterior part of the urethra, but behind the orifice, require to be mechanically dilated, by the introduction of bougies or metallic instruments. At all events, I know of no better method of treatment; and sometimes the patient obtains relief on very easy terms, the dilatation being readily accomplished, and the use of a bougie once in three or four days being sufficient to prevent a recurrence of the contraction. At other times, however, the disposition to contract is so great, that it becomes necessary to introduce the bougie once or twice daily; and, indeed, I have known cases in which the patient was seldom able to expel his urine until the bougie had been employed.

The simple rules which have been just laid down are not sufficient for the treatment of strictures at the bulb of the urethra. The circumstances of these being situated where the curvature of the urethra begins, at a distance of six or seven inches from the external orifice, and their liability to spasm, distinguish them from

strictures in the anterior part of the canal. The management of them requires greater skill, attention, and experience on the part of the surgeon; but, at the same time, it must be acknowledged that it leads, on the whole, to more satisfactory results than that of strictures, which take place elsewhere.

If you were to ask me, How then do you treat strictures at the bulb of the urethra? my answer would be, I have no particular method: sometimes I adopt one method, sometimes another, according to the peculiar circumstances of the case. I shall describe the different plans of treatment to which you may have recourse, at the same time endeavoring to point out the particular class of cases to which each of them is applicable.

I should premise that the disease is not to be cured by medicines; though medicine may sometimes be used with advantage in aid of the local treatment. Thus, where the liability to spasm is increased by a too abundant secretion of lithic acid by the kidneys, whether it shows itself in the form of red sand, or of small calculi, or of lithate of ammonia, attention to the diet and mode of life, and the exhibition of purgatives and alkalis, and such other remedies as may tend to restore the urine to a healthy condition, will be of essential service, and will enable you to accomplish, by means of the bougie, what you would in vain have attempted to accomplish otherwise. In like manner, in cases of alkaline urine, a generous diet, and the exhibition of mineral acids, opiates, and tonics, will be productive of a similar advantage. In all cases attention should be paid to the state of the bowels, and the patient should be made to understand that a careful and regular mode of life in every respect is necessary to his recovery; and that violent bodily exercise, especially riding on horseback, is always to be avoided. In long-standing cases of unusual difficulty and complication, I have sometimes found it necessary to keep the patient confined to a sofa, or even to his bed, for some days before I began the peculiar treatment which his case required. Where, before the patient comes under your care, instruments have been much employed, without having penetrated through the stricture, it is always desirable that the urethra should be left for some time in a state of repose. At the end of a month or six weeks, the false passage (if any existed) may have healed; the inflammation produced by previous operations may have subsided; and you will begin the treatment under much more advantageous circumstances than if you had entered upon it in the first instance.

The methods which are chiefly useful in the case of stricture at the bulb of the urethra, are:—1st, the dilatation of it by means of the common plaster bougie; 2dly, the dilatation of it by means of a metallic bougie, catheter, or sound; 3dly, the retention of the elastic gum catheter in the urethra and bladder; 4thly, the application of the bougie armed with the nitrate of silver.

1. The common plaster bougie, if of a small size, should be of a conical shape: but if of a middle size, or of a full size, it should

be cylindrical. Ascertain the size of the stream of urine, and introduce a bougie of this size, whatever it may be. If the bougie be very small, it may be used straight, otherwise it should be curved like a catheter, but in a less degree. Neither you nor your patient are to be disappointed because the bougie does not enter the stricture at the first trial. In many cases this will not happen until you have seen your patient three or four times; and in very difficult cases the delay may be still greater than this. When a bougie has once entered the stricture and bladder, allow it to remain for a few minutes. In two or three days (not sooner) introduce either the same bougie, or one of the same size. Then withdraw it, and introduce one of a size larger. Allow this also to remain for a few minutes, and after two or three days more repeat the operation. Thus, by degrees, you dilate the stricture until it is of the same diameter with the rest of the urethra. This method of curing strictures is applicable to a great number of cases; and, wherever it will answer the purpose, I would advise you to resort to it in preference to other methods. The common bougie gives the patient little or no pain; it excites no irritation, unless it be introduced clumsily or rudely; and it can do no harm by penetrating or tearing the membrane of the urethra.

II. The metallic instruments which I am in the habit of employing are not those which are sold under the name of the flexible metallic bougies. These are liable to lose the shape which you have given them during their introduction, and, in fact, are at the same time too flexible and too inflexible for any useful purpose. Those which I have, if of a small or middle size, are made of solid silver; the larger ones of silver or steel, or steel plated, or of a composition similar to, but firmer than, that of the flexible metallic bougie. These sounds should be very slightly curved, and for ordinary cases not more than eight inches and a half or nine inches long, exclusive of the handle. You may use them as you would use the common bougie for the purpose of gradually dilating the stricture, beginning with one of a small size, and gradually proceeding to those which are larger. Sometimes you will find it best to introduce the sound without turning, that is, with the concavity towards the patient's abdomen; at other times you will pass it more readily by keeping the handle, in the first instance, towards the patient's left groin, turning the instrument afterwards as it approaches the stricture. In either case if you wish to avoid making a false passage, take care that the point is kept sliding, as it were, against the upper part of the urethra. Press the instrument firmly, but gently, against the stricture, in the expectation that it will gradually become dilated, and allow the point to enter; then depress the handle and pass it into the bladder, provided that you can do so readily, and without the application of force; but not otherwise. Two or three days afterwards (and the interval ought to be never less than this, and sometimes it ought to be greater), introduce the sound which has been passed before, withdraw it and introduce

another of a size larger, and thus go on dilating the stricture until that part of the urethra has regained its natural diameter. If in the course of these proceedings you are in doubt whether the sound has reached the bladder or not, you may easily determine the point in question by introducing a catheter. You might, indeed, use the catheter from the beginning, but that the openings near the point, and its comparative lightness, render the introduction of it less easy than that of the solid instrument.

This method of treatment is applicable to a large proportion of the cases which you will meet with in practice: 1st, to those of old and indurated strictures, which the common bougie is incapable of dilating; 2dly, to those in which, in consequence of some improper management, a false passage has been formed, into which the point of a common bougie will easily penetrate, but which an inflexible instrument may be made to avoid; 3dly, to those in which, from long-continued disease, and without any previous mismanagement, the urethra has become distorted, and its surface irregular; and, 4thly, to several recent cases in which the smooth polished metallic surface gives less pain to the urethra, and is less likely to induce spasm, than the softer but less smooth surface of a common bougie. The temper of the urethra varies as much as the temper of the mind. Where circumstances seem to be nearly the same, you will find one method of treatment to suit one case, and another to suit another case; and it will often happen that you cannot determine beforehand which method it will be best to adopt.

But the treatment which I have just described is not applicable to the most difficult class of cases which you will meet with in practice. In using a small metallic instrument, there is always a great risk that it may penetrate the membrane of the urethra, and make a false passage, instead of entering and dilating the stricture; and, therefore, in a case in which a stricture has been long neglected, and is reduced to a very narrow diameter, some other mode of proceeding is required. You may try a small plaster or catgut bougie first, and defer the use of the sound until the stricture is so far dilated as to justify the expectation that one of a moderate size may be passed. If this cannot be accomplished, you may resort to another method, which will rarely fail. In speaking of the use of the silver catheter, where the patient labors under a total retention of urine, I said: "Press the catheter firmly and gently against the stricture, keeping in your mind the anatomical position of the parts, and being careful to give the point a right direction. When the pressure has been thus carefully continued for some time, the stricture will begin to relax, allowing the catheter to enter," &c. &c. Now, in attempting the cure of old and inveterate cases of stricture, you will often find it convenient to act on the same principle, and in very many of them you will find this mode of treatment to be successful, where all others have failed. The sound should be rather above than below the middle size. Of course the same rule in this respect does not apply in every instance, but that which I

generally find it most convenient to employ, has only a moderate curvature. It is made of silver, fixed in a flat wooden handle, being nine inches in length from the handle to the point; no part of it is more than one-fifth part of an inch in diameter, and at the point the diameter is reduced to one sixth of an inch.

In using the sound you should pass it carefully as far as the stricture, and then press the point firmly and steadily against it, taking care that it is directed in the line of the urethra towards the bladder. The pressure is to be continued for five, ten, or fifteen minutes, or even longer, according to circumstances; and this process is to be repeated once in two or three days. If a false passage exists, it is probably on the lower part of the urethra towards the perineum; and it is in this situation that, by careless management, one may be easily made. To avoid this mischief, you must direct the point of the sound especially to the upper part of the stricture next the pubes. The pressure should be as much as can be made without the urethra being lacerated, and without inducing any considerable degree of pain. In some instances the stricture has little or no sensibility, in others it is exquisitely tender; and in the latter cases the pressure should be very trifling at first, but it may be gradually increased as the tenderness subsides (as it will do) under its influence.

The result of this treatment is, that at each operation the anterior part of the stricture seems to become relaxed to a greater or less extent; and that at last the instrument penetrates entirely through it and enters the bladder. The period at which this happens, of course, varies in different cases. The permanent change of structure may be trifling, the stricture being chiefly spasmodic, and one or two applications of the sound may be sufficient. There may be much gristly induration, oocupying a considerable portion of the urethra, and many applications may be required. A patient was under my care, in whom the stricture was surrounded by a mass of hard substance, which could be distincly felt in the perineum, apparently an inch or an inch and a half in length. The stream of urine was of the smallest size, and varied so little that it was evident that there was little or no liability to spasms. For many years before I was consulted, no instrument had been made to enter the bladder; and the ordinary methods, after a long trial, failed in my hands, as they had done in those of others. At last I succeeded by the method which I have just described, but not till I had persevered in it for many months.

III. In treating a stricture of the urethra with the gum catheter, you are to introduce it, and allow it to remain day and night in the urethra and bladder. If the patient can bear it to be retained for a sufficient length of time, the stricture will become dilated not only to the size of the instrument employed, but to a size considerably larger. Perhaps you will be able to introduce the catheter without the wire or stilet. Do so, if possible. If not, you should employ one mounted in the way which I have already explained,

on a strong, unyielding iron stilet, having a flattened iron handle like that of a common sound or staff. Being so mounted, it is more readily directed into the bladder than when mounted in the usual way, on a piece of thin flexible wire. When the gum catheter has entered the bladder, withdraw the stilet, and leave the catheter, with a wooden peg in its orifice, which the patient is to take out, whenever he has occasion to void his urine, it being at the same time secured by a suitable bandage. After three or four days you may withdraw the catheter for twelve hours; or if much suppuration be induced in the urethra, you may withdraw it for a longer period. Then introduce another catheter larger than the first; and thus you may, in the course of ten days or a fortnight, dilate a very contracted urethra to its full diameter. This is a very certain and expeditious method of curing a stricture. You may by these means sometimes accomplish as much in the course of ten days, as you would accomplish in three months by the occasional introduction of a bougie. This method is particularly applicable,—

1st, Where time is of much value, and it is of great consequence to the patient to obtain a cure as soon as possible.

2dly, Where a stricture is gristly and cartilaginous, and therefore not readily dilated by ordinary methods.

3dly, Where, from the long continuance of the disease, the urethra has become irregular in shape, or where a false passage has been made by previous mismanagement. Under these circumstances, if you can succeed in introducing a gum catheter, and let it remain for a few days in the bladder, you will find your difficulties at an end; the irregularities will disappear, and the false passages will heal.

4thly, There is still another class of cases, in which this method of treatment is particularly useful. I allude to those in which a severe rigor follows each introduction of the bougie. This disposition to rigor is such, that it is sometimes impossible to proceed with the treatment in the ordinary way. Observe, in these cases, when the rigor takes place. It seldom follows the use of the bougie immediately. It almost always occurs soon after the patient has voided his urine, and seems to arise, not as the immediate effect of the operation, but in consequence of the urine flowing through the part which the bougie has dilated. Now, if, instead of a bougie, you use a gum catheter, and allow it to remain, the urine flowing through the catheter, the contact of it with the urethra is prevented, and the rigor is prevented also. I have no right to say that this plan will invariably succeed, but I do not remember that it failed in a single case among many, in which I have resorted to it.

IV. It remains for us to consider the treatment of a stricture by the application of caustic. This mode of treatment was first proposed by Mr. Hunter, who recommended it in particular cases. The more general application of the caustic to strictures was introduced by Sir Everard Home, with whose work on the subject of this diseased you ought to be well acquainted. The caustic to be employed is the nitrate of silver. Let a cylindrical piece of it be

inserted neatly into the extremity of a bougie. The round end of the bougie should be cut off, and the caustic should be as large as the bougie will carry; and the bougie itself should be as large as the urethra will admit without being forcibly distended. First, pass a common bougie down to the stricture, and mark with your nail on the bougie the distance of the stricture from the external orifice of the urethra. Then measure off the same distance on the armed bougie; pass it down to the stricture, and keep it pressed against it with a firm, heavy hand, during the space of a quarter of a minute, and sometimes for a longer time. Let this be repeated, if necessary, every third or fourth day; for every second day, as some have recommended, is, according to my experience, much too often. I have advised that you should press it firmly against the stricture, as otherwise the caustic is applied to the urethra anterior to the stricture, and not to the stricture itself. The first effect of the caustic is to cause the stricture to become dilated to a certain extent, probably by relieving whatever disposition there is in it to spasm. It is a strong stimulus applied to a part which is morbidly irritable, and the morbid irritability becomes exhausted. The benefit which the patient derives immediately from the application of the caustic, is sometimes very remarkable. He may apply to you, making water in a stream like a thread, or only in drops; you apply the caustic, and in a few minutes afterwards he has a desire to discharge the contents of his bladder, and he finds that the urine flows in a very considerable stream. After this, any further benefit to be produced by the caustic must be the result of the destruction of the stricture, by the repeated formation of sloughs. But this is a tedious and difficult process, especially in cases of old cartilaginous stricture. In fact, there are very few such cases, in which a cure can be effected by the caustic alone, however long you may persevere in its use; and whenever the caustic is frequently employed, you are in danger of creating a false passage, in consequence of the dissolved caustic flowing to the lower part of the urethra, and destroying the parts unequally.

The cases to which this method of treatment is applicable, are, 1st, Those of spasmodic stricture, where two or three applications of the caustic may be sufficient to relieve all the urgent symptoms. 2dly, some cases of old stricture, in which there still is a considerable disposition to spasm. In these last cases, apply the caustic two or three times, and no oftener. It will probably relieve the contraction as far as it is spasmodic, and thus enable you to proceed more advantageously with the use of the bougie or metallic sound. 3dly, The caustic may be used very properly in some cases of stricture which are endowed with peculiar irritability, in which every application of the common bougie induces severe pain, or brings on spasm, preventing it entering the stricture. Two or three applications of the caustic may be sufficient to deprive the stricture of that unnatural sensibility, which otherwise would have foiled your efforts to effect a cure.

Notwithstanding what I have now stated, I very rarely use the armed bougie in my own practice, and I never resort to it in the first instance.

My reasons for preferring the other methods of treatment, in ordinary cases, are these: 1st, Although the caustic often removes spasm, it also very often induces it. It is true, that in many instances it enables a patient to make water with more facility; but in many instances, also, it brings on a retention of urine. 2dly, Hæmorrhage is a more frequent consequence of the use of the caustic than of the common bougie, and it sometimes takes place to a very great, and to an almost dangerous extent. 3dly, Where there is a disposition to rigors, the application of the caustic is almost certain to produce them; and frequently the application of the caustic induces rigors, where there had been no manifest disposition to them previously. 4thly, Unless used with caution, the application of caustic may induce inflammation of the parts situated behind the stricture, terminating in the formation of abscess. I have known of some cases of abscesses formed under these circumstances, which, from their peculiar situation, have proved more troublesome and more difficult to manage than the original disease. In one case, which came under my observation many years ago, and in which, from the account given me, I was led to believe that a surgeon had been too liberal in his application of caustic to a stricture, a succession of abscesses took place, extending in various directions, even to the nates, and attended with great disturbance of the constitution. The patient went into the country, where, as I have been informed, he ultimately sunk under the combined effects of the stricture and abscesses.

These are the principal evils which follow the use of the caustic; but there are other arguments against it in particular cases. If the bougie has been improperly used, and a false passage has been produced, or if there be the beginning of a false passage, the dissolved caustic will penetrate into this false passage, and aggravate the mischief instead of destroying the stricture. In cases of old stricture, where there is much alteration in the structure of the parts, the caustic is absolutely inadequate to the cure; and in many other cases, although the caustic may effect a cure at last, it does so by a very tedious process; and a cure would be effected in a much shorter space of time by the introduction of the metallic sound, or the retention of the gum catheter.

There is still some other methods of treating stricture, but what I have to say concerning each of them may be comprised in a few words. Mr. Arnott has invented what he calls a dilator, made of a tube of varnished silk, which is to be introduced into the stricture, and then dilated by impelling air into it with a syringe. The contrivance is ingenious; and I should think it very likely to be useful, where you wish to dilate the female urethra for the purpose of extracting a calculus. It may be useful also, in dilating the orifice of an abscess or sinus, being used instead of a sponge tent. But it does not appear to me that either this, or a steel dilator, which I remember some one to have invented formerly, is likely to render us much assistance in the cure of a stricture. Such a dilator, must be of a certain size. It cannot be supposed to be less than a

middle-sized bougie. Now, if you can manage to introduce a bougie, or sound of a middle size into a stricture, the farther dilatation of it is easy enough, the cure may be said to be all but accomplished, and neither of the dilators is wanted. On the other hand, if the stricture be much contracted, the introduction of the dilator will be impossible. It is stated by Mr. Arnott, that the method proposed by him has this advantage, that it enables you to carry the process of dilatation farther than it can be carried by a bougie or sound, and that such farther dilatation removes the disposition in the urethra to contract, and thus produces a permanent cure of the stricture. I am by no means satisfied as to the correctness of the first of these assertions; and as to the second, it is entirely contrary to my own experience of the effects of very large bougies. I have generally observed, that the dilatation of a stricture beyond the natural size of the canal is followed by pain and inflammation, and an aggravation instead of a diminution of the complaint.

Mr Stafford has invented an ingenious machine, which is intended to divide a stricture by means of a cutting instrument. If any cases occur in which this method may be useful, they are undoubtedly very few in number; and great caution must be required, to avoid making false passages, which might be followed by effusion of urine and purulent deposits. There is, however, a modification of this practice which is free from these dangers, and which may be resorted to in certain cases, with great advantage, as I shall explain presently.

It has been proposed, in cases of very old stricture, to make an incision in the perineum, so as to expose the whole of the contracted part of the urethra, and to divide the stricture with a knife, introducing a gum catheter afterwards through the urethra into the bladder, and allowing the wound to heal over it. I have performed this operation myself in one instance, and with success; and I have heard of it being performed several times by others. In the greater number of cases (according to the reports which I have received), it has been performed with difficulty, and in some instances the patient has been sent to bed without it having been completed. Even under the most favorable circumstances, it cannot be otherwise than doubtful whether the stricture be properly divided, that is, whether the incision has passed through the narrow canal in the center, or through the solid substance on one side. I suppose that no surgeon would recommend such an operation except as a last resort, where no instrument could be made to pass through the stricture by other means. But such cases of impenetrable stricture are of very unfrequent occurrence; and where they do occur, I am much mistaken if the modification of Mr Stafford's operation, to which I have already alluded, will not effect a much easier and safer method of cure. In the following case (the only one in which I have had recourse to it) it succeeded perfectly:—

A man, forty years of age, was admitted into St. George's Hospital, in the year 1835, laboring under a stricture, near the bulb of the urethra, complicated with a fistulous opening in the perineum. When he voided his urine, a very small quantity came away by the urethra,

the greater part being discharged by the perineum. The disease had existed for more than twenty years, and the abscess in which the fistula had originated had followed an injury received while riding on horseback thirteen years ago. For many years no instrument had been passed through the stricture. At last he became a patient under the late Mr. Earle, in St. Bartholomew's Hospital, where he remained under treatment for five months, but with no more success than formerly.

Finding after repeated trials that the instrument could be made to penetrate through the stricture, with the concurrence of my colleagues, I performed the following operation:—

The patient having been placed in the same position as in lithotomy, a full-sized plaster bougie was introduced, and held by an assistant with its extremity resting against the stricture. I then made an incision in the perineum, dilating the fistulous sinus, and laying open the membranous part of the urethra as far forward as the stricture, the exact situation of which was marked by the bougie. The bougie was then withdrawn, and an instrument was introduced in its place, consisting of a straight silver tube, closed at its extremity, except a narrow slit, through which a small lancet could be made to project by pressing on a stilet which projected the handle of the instrument. The round extremity of the tube being pressed against the anterior part of the stricture, I applied the fore-finger of the left hand, introduced through the wound in the perineum and urethra, to its posterior surface. The pressure of the instrument being distinctly communicated to the finger through the substance of the stricture, the lancet was protruded, and the stricture was divided. A silver catheter was then easily introduced through the urethra and the divided stricture into the bladder, and allowed to remain there. The urine of course flowed through the catheter. At the end of two days the silver catheter was removed, and replaced by one of elastic gum. The wound in the perineum gradually healed, and the patient ultimately recovered, making water in a full stream, and being able to introduce a sound of a full size into the bladder, so as to prevent a recurrence of the contraction.

The instrument used upon this occasion was ten inches in length, exclusive of the handle, and rather more than one quarter of an inch in diameter. The lancet measured three-sixteenths of an inch at its broadest part; it terminated in a sharp point, and could be made to project, by pressing a button on the other end of the stilet to which it was attached, to the length of half an inch, returning to its place within the silver tube, when the pressure was withdrawn, by the action of the spiral spring. In using it, one cutting edge of the lancet was directed towards the pubes, the other towards the perineum. The advantages of dividing the stricture by this method, as compared with other methods of operating, are, 1st, that the free opening made in the perineum prevents all danger from infiltration of urine; 2dly, that the fore-finger of one hand, being applied to the posterior surface of the stricture, serves as a guide for the lancet and enables you, with

the exercise of a little skill and caution, to make an exact division of the stricture.

In many cases of stricture, especially where the disease has existed for several years, you find that, although a bougie may be passed through the contracted part of the urethra, it will not enter the bladder. You may possibly succeed in the introduction of a metallic sound or catheter, when you have failed to introduce a bougie; but not unfrequently the obstruction which has prevented you from passing the bougie, will prevent you from passing the metallic instrument also. The obstruction in these cases arises from the irregularity of the surface of the urethra, where it is surrounded by the prostate gland, the immediate causes of which I have already described; and sometimes from enlargement of the prostate gland itself. If you use violence, or employ any but the gentlest treatment, you lacerate the membrane of the urethra, and the substance of the prostate. You make a false passage leading into the space between the bladder and the rectum, which may prove a source of constant trouble and perplexity afterwards. When you meet with the difficulty which I have mentioned, do not be overanxious immediately to overcome it. It is not the original disease, but the effect of the stricture. Remove the cause, and the effect will cease, not indeed at once, but by degrees. Be contented at first with the dilatation of the stricture. The urine will then flow in a full stream, and the pressure of it on the parts behind being removed, they will regain their healthy condition; so that at last the catheter, or even the common bougie, will enter the bladder readily.

I say that you are not, under the circumstances which I have described, to use violence. But I cannot too strongly impress it on your minds, that, in the treatment of stricture, you ought not to use violence under any circumstances. Your success in the cure of this disease will depend very much on your attending to this important rule. Whether you use a bougie, or a sound, or a catheter, let the instrument be held lightly, and, as it were, loosely, in your hand; it will then in some measure, find its own way in that direction in which there is the least resistance: whereas, if you grasp it with force, the point can pass only where you direct it, and is just as likely to take a wrong course as a right one. A stricture will invariably resent rough usage: it will yield to patience and gentle treatment.

In a few cases of incipient stricture, and in some of those in which a stricture is merely spasmodic, after a bougie has been used for a certain length of time, the use of it may be dispensed with, and there will be no recurrence of the stricture. But these cases are rare exceptions to the general rule, which is, that there is danger of a relapse, and that a patient who is desirous of continuing well, must submit to the occasional use of the bougie ever afterwards. I generally instruct the patient in the introduction of it for himself. At first he may introduce it once in three or four days. He may afterwards use it at longer intervals, and he must take some pains to determine what those intervals should be. One person will find it necessary never to omit the use of the bougie for a longer period than a week, and another will

not have occasion to resort to it oftener than once in a month or six weeks.

The management of a case of stricture in which the patient is liable to attacks like those of intermittent fever, is often very perplexing. Occasionally, every introduction of a bougie is followed by a rigor, which is not only distressing to the patient at the time, but leaves him in a state of debility from which he may not recover for several days. And sometimes the rigor, as I have already explained, is only the precursor of a still worse train of symptoms, assuming the character of simple continued fever, of rheumatic fever, or even of mania. It is impossible to continue the use of the bougie under these circumstances. If you would cure the stricture, you must prevent the rigors. I have already mentioned one way of attaining this object, namely, by leaving the gum catheter in the bladder. You may also, in many instances where you expect the occurrence of a rigor, anticipate the attack by giving your patient a dose of opium, either by the mouth or in the form of clyster, immediately after you have introduced the bougie. But you are not to be contented with meeting the present difficulty. You should look to the future, and endeavour to correct that state of the system on which the disposition to rigors depends. For example, I was sent for to see a gentleman who had long suffered from a stricture of the urethra, and who was at the time labouring under a severe attack of retention of urine. I drew off his urine with a small elastic gum catheter, which was passed with the greatest facility into the bladder. In the course of two or three hours he experienced a desire to void his urine. It flowed readily in a stream, but immediately afterwards he was seized with a violent rigor. He remained feverish for a day or two, and then recovered. After a few days had elapsed, I began the dilatation of the stricture with a common bougie. The bougie was introduced without any difficulty, but it was followed by a rigor. The next time that the bougie was employed, there was a third attack of the same kind; and on the bougie being again resorted to, another and another rigor followed. I now omitted for a time the use of the bougie, and prescribed two grains of the sulphate of quinine to be taken every six hours. Under this treatment the patient's general health manifestly improved; and when, at the end of a week or ten days, we had recourse to the bougie, there was no recurrence of the rigors.

LECTURE IV.

Treatment of Stricture of the Male Urethra—continued. Urinary Abscesses and Fistulæ.

You will meet with no cases in your practice of greater importance than those of urinary abscess, connected with stricture of the urethra; nor are there any in which the different results obtained from good

and bad surgery are more conspicuous than in these. If an abscess, with distinct fluctuation of matter, presents itself in the perineum, no one would hesitate to make an opening for the purpose of enabling the matter to escape. But it will often happen that there are urgent constitutional symptoms, and that a patient is in a state of the greatest danger, while the abscess is still confined behind the deep-seated fascia, the only external manifestation of it being a slight degree of fulness, and deep-seated hardness of the perineum. These, however, will be your sufficient guides. Bearing in mind the anatomical position of the parts, introduce a sharp-pointed double-edged scalpel, so as to penetrate the fascia. Watch for the first drop of matter which escapes, and then dilate the opening which you have made downwards and outwards, that is, in the same direction as the incision in lithotomy. There is here no time for hesitation and delay. Many lives have been preserved under these circumstances, by the prompt interference of the surgeon, which would have been lost othewise. A urinary abscess cannot be opened too soon whenever it appears, and the opening should be as free as it can be made with prudence. This last observation is especially applicable to those cases in which the abscess shows itself in the lower part of the penis over the scrotum. If in such cases there be merely a small puncture, there is danger of some of the contents of the abscess being infiltrated into the loose cellular texture, producing an œdematous swelling first, and a succession of fresh abscesses afterwards.

I have known some surgeons formerly, who supposed that a fistula connected with the urethra, required to be laid open like a fistula connected with the rectum. But I suppose that few are liable to fall into such an error in the present day. The only cases of this description, in which the use of a bistoury or lancet may be required, are those in which there is a lodgment of matter in some part of the perineum, and in which a more free external opening is necessary for its escape.

The treatment of a *fistula in perineo* is, indeed, for the most part, as simple as possible. It is kept open by the urine flowing through it; and as soon as the urine finds a more ready outlet by the natural channel, the sides contract, and the sinus closes of itself. While the urethra remains contracted, no art can heal the fistula; nor ought you to wish to heal it, if it were possible for you to do so. But let the stricture be dilated, and in the great majority of cases the healing of it will be completed, even before the dilatation has gone so far as to restore the urethra to its original diameter.

Sometimes, however, the healing of the fistula proceeds more slowly; and this especially happens where the opening is of a large size, in consequence of there having been some loss of substance from sloughing of the cellular membrane at the time of the abscess being formed. Even in these cases you will seldom find any other treatment necessary than that of dilating the stricture to the full diameter of the urethra, and then keeping it dilated by the daily introduction of a sound or catheter. The opening in the perineum may not close for a month, nor for six months, nor even for a year; still it will close at

last. I formerly have advised the patient never to void his urine without the aid of the catheter; but I am now inclined to believe that the irritation thus kept up tends, on the whole, to delay rather than to expedite the cure. At other times I have kept the patient in bed for some weeks, with an elastic gum catheter constantly in the urethra and bladder; but I cannot say that, with my present experience, I have much more faith in this mode of treatment than in that which I mentioned before. After a few days the urine generally begins to flow by the side of the catheter, which does not therefore answer the purpose for which it was introduced, of preventing its escape by the sinus. Then in many cases the catheter causes an abundant suppuration of the urethra; and the purulent discharge, finding its way into the sinus, prevents it from closing as much as it would be prevented by the contact of the urine. The following plan of treatment may, however, occasionally be used with some advantage, in aid of the daily introduction of the sound. Stimulate the bottom of the sinus once in three or four days by the application of the nitrate of silver, at the same time that you retard the healing of the external orifice by lightly touching it, once in a week or fortnight, with a caustic potash. The reason for applying the caustic potash is as follows:—The external opening is more inclined to heal than the opening into the urethra. If you stimulate the whole surface of the fistula with the nitrate of silver, the superficial parts may heal prematurely; the necessary consequence of which will be another abscess and another discharge of matter. By applying the caustic potash to the external opening, you prevent this from healing, while the nitrate of silver promotes the contraction and cicatrization of the more deep-seated part of the fistula.

An abscess or fistula, which has no opening except into the urethra, is to be treated in the same manner as the same kind of abscess in connection with the rectum. Watch for the opportunity when matter is collected in it, and then establish an external opening by dividing the integuments over it with a lancet, so as to convert it into a fistula of the ordinary kind. There are some of these cases, however, the treatment of which requires a more particular explanation. A patient may apply to you who perhaps has had gonorrhœa formerly, followed by a slight obstruction of the urethra, complaining at the same time of a discharge from the urethra, which he calls an obstinate gleet. You examine the perineum, and you find in it a small tumor, not larger than a horse-bean or filbert. It is at some distance from the surface, and the patient says that it has been co-existent with the gleet, and that it is sometimes inflamed and tender. Now this little tumor indicates the existence of a blind fistula. There is a small orifice in the urethra, and a narrow channel leading from it into the centre of the tumor; and every time that the urine flows, a very small quantity finds its way into this channel, escaping from it immediately afterwards by regurgitation into the urethra. In consequence of the smallness of the cavity, and the quantity of solid matter deposited on its outside, the fluctuation of fluid in it is not perceptible. I have known this state of things to continue, producing more or less occasional inconvenience,

for many years. The first thing necessary to the cure is to make an opening in the perinæum leading into the cavity in the centre of the tumor. But this may not be very easily accomplished, on account of the smallness of the cavity. You should introduce the lancet somewhat obliquely, so as to divide the tumor as nearly as possible through its centre. Then introduce some lint, so as to prevent the wound uniting by the first intention. After three or four days you may remove the lint, and then you will ascertain whether you have done what was required, by observing whether, when the patient voids his urine, any portion of it flows through the opening which you have made. If this be the case, nothing further is required than that the stricture should be dilated in the usual way. If, however, no urine flows through the opening, you may proceed thus:—Introduce a piece of caustic potash through the wound into the centre of the tumor, so as to make a considerable slough. A portion of the tumor being thus destroyed, the probability is that, when the slough has separated, it will be found that the central cavity is exposed, and that you have accomplished the object which you had in view

We occasionally meet with cases in which there is a fistulous opening into the urethra in some part of the space between the scrotum and the external orifice. Where the opening is of a small size, it may usually be made to contract and heal by touching the margin of it occasionally with the nitric acid or nitrate of silver. Where, however, there has been a considerable loss of substance, either from ulceration or sloughing, it is impossible to close the opening without borrowing a portion of skin from the neighboring parts. Sir Astley Cooper and Mr. Earle have published an account of some cases in which this operation was attended with success. Since then, Mr. Dieffenbach has performed it in a great many instances. You will find an account of his practice in the "Dublin Journal of Medical Science," to which I may refer you for further information on the subject.

Obstructions of the Urethra arising from Mechanical Injury. Treatment.

The obstructions of the urethra which are occasionally met with as the result of mechanical injury necessarily produce many symptoms corresponding to those which occur in ordinary cases of stricture. They differ from them, however, in some essential circumstances, and therefore require a separate consideration.

These obstructions may take place in any part of the canal, and may be produced in various ways. A foolish boy contrived to slip his penis into a small metallic ring. The swelling of the glans made its removal difficult, and, when this was at last accomplished, it had caused ulceration of the skin and *corpus spongiosum*, extending into the urethra. As the ulcer healed, the urethra became contracted; and when the patient was admitted into the hospital some time afterwards, there was a small fistulous orifice in the middle of a hard cica-

trix, through which the greater part of the urine was discharged, while a common probe was with difficulty passed from the external orifice through that portion of the urethra which was included in the cicatrix.

But the more frequent seat of the obstruction is that part of the urethra which is immediately below the pubes, where the mucous membrane is especially liable to suffer from a blow, compressing it against the hard substance of the bone. In some cases these obstructions are formed where there is no evident injury of the integuments or the other superficial parts of the perineum. For example, a man, twenty-two years of age, while riding a restive horse, was suddenly thrown forwards, so that his perineum received a severe blow from the pummel of the saddle. The accident caused at the time a severe pain, attended with a discharge of blood from the urethra. The bleeding continued during the night, but had ceased on the following morning. He then experienced a smarting pain in making water, which however subsided in a few days. During the following month he suffered no inconvenience, but he now observed that his stream of urine was diminished in size, and that it was sometimes divided into two. The diminution of the stream continued, with a good deal of pain as the urine flowed. At last there was a complete retention of urine, which however subsided spontaneously in the course of a few hours. Seven months after the accident, when he was admitted into the hospital, the urine flowed in a stream not larger than a small wire. The catheter met with an obstruction behind the bulb of the urethra, and one of a very small size was with great difficulty introduced into the bladder, passing over what appeared to be a hard gristly and irregular surface. The dilatation of the contraction was not accomplished without a great deal of both local and constitutional disturbance, and it was not until after the lapse of five months that the patient was able to leave the hospital. At this time a catheter of a middle size could be introduced into the bladder, and the urine flowed in a stream, much below the natural size, but sufficiently large to enable the bladder to be emptied without difficulty.

In other cases a deep wound of the perineum may extend into the urethra. If the urethra be only partially divided, I conclude that no more mischief will ensue there after the operation of lithotomy; but if the division be complete, it is difficult to conceive that in the progress of cicatrization a contraction of the urethra shall not ensue. I met with an example of this in a child, who had received a wound of the perineum some time before (if I recollect rightly) from a broken glass bottle. There was a hard cicatrix immediately below the pubes and behind the scrotum, and a fistulous sinus through which the urine flowed, while scarcely any was passed by the natural passage.

But there are cases of more frequent occurrence, in which a blow on the perineum has lacerated the urethra, confused the parts between it and the skin, caused an effusion of blood into the perineum and scrotum, some portion of urine becoming infiltrated into the cellular membrane afterwards; the result of the whole being the formation of an abscess, and the destruction of the injured parts by sloughing to a

greater or less extent. Here, as the sore heals, a hard gristly cicatrix is generated, adhering to the pubes, with an orifice in the centre, through which the whole or the greater part of the urine is discharged.

The condition of a patient under the circumstances which have been described is much worse than that of one who labours under a perineal fistula connected with an ordinary stricture of the urethra. The difficulty of voiding the urine is more constant; it is liable to be increased, so as to become a complete retention, from attacks, not of spasm, but of inflammation, producing at the time much pain in the perineum, and followed by a fresh accumulation of matter beneath the cicatrix; and, in addition to all this, the treatment of these cases is not less troublesome to the surgeon than it is distressing to the patient, and for the most part does not lead to the same satisfctory results as that of ordinary stricture.

In all cases in which there is reason to believe that the urethra has been divided or lacerated in consequence of an injury inflicted on the perineum, it is the duty of the surgeon, not only to look at the great and immediate danger, but to guard against future ill consequences; and much may be done at this period towards preventing a most serious inconvenience, which would be relieved with difficulty afterwards. If there be a penetrating wound, in which the urethra is probably implicated, an elastic gum catheter should be introduced with the least possible delay, and allowed to remain in the urethra and bladder until the healing of the wound is far advanced, or, at all events, until it is ascertained that the urethra has not suffered; the catheter being however occasionally removed for a limited time, if it seems to act as a source of irritation.

In cases of contusion of the perineum, when the effusion of blood in the perineum and scrotum, and more especially the discharge of blood from the urethra, or any other circumstances, lead to the suspicion that the urethra has been lacerated, the same treatment should be had recourse to: the gum catheter should be introduced as soon as possible, and allowed to remain for at least some days after the occurrence of the accident. The extravasion of blood does not in itself justify the making an incision in the perenium; and indeed, according to my experience, there can be no worse practice than that of making an incision in a case of simple ecchymosis, either in this or in any other situation. But where such extravasation exists, there is always reason to apprehend that there may be further mischief; the progress of the case, therefore, should be carefully watched, and on the first appearance of any symptoms which might be supposed to indicate that urine had escaped into the cellular membrane, or that suppuration had begun to take place, a staff should be introduced into the urethra instead of the gum catheter, and a free incision should be made from the perineum into it, the gum catheter being replaced afterwards.

But it may be that these measures of precaution have not been adopted in the first instance, and that you are not consulted until after the lapse of a considerable time, when the wound or laceration of the urethra is already healed, leaving the urethra contracted in the

situation of the cicatrix. Here you may perhaps succeed in gradually dilating the urethra, as where there is an ordinary stricture. But, in a case which I have already mentioned, I have stated that "this was not accomplished without a great deal of local and constitutional disturbance;" and so it has been in all the cases of this kind which have fallen under my observation. Nor will the occurrence of such difficulties be a matter of surprise to any one who bears in mind that here the object is to dilate, not a genuine stricture, but a cicatrix, of the urethra, and who has observed how the cicatrix of an old sore leg inflames and cracks when the subjacent muscles begin to increase in bulk from exercise, or how the endeavour to extend forcibly the contraction after an extensive burn produces the same result. It may be that these difficulties are insuperable under the method of treatment by simple dilation; and under these circumstances, a small staff having been introduced into the bladder, the cicatrix of the urethra should be divided by an incision from the perineum, a gum catheter being introduced afterwards, and allowed to remain until the wound is healed over it. But even then much remains to be accomplished. The cicatrix has still a greater disposition to contract than an ordinary stricture; the bougie or catheter must be had recourse to almost daily, and the patient must be contented if he can persevere in the use of instruments of a moderate diameter, as the urethra will invariably resent the attempt to keep it dilated by those of large dimensions.

Under the treatment which has been just described you will rarely fail to improve the condition of the patient in those cases in which the injury of the urethra has been of limited extent. But it is otherwise with respect to those other cases in which there has been an actual loss of substance of some portion of the canal from ulceration or sloughing. Here, either the patient must be left to the discomfort and misery of voiding the whole of his urine by the perineum for the remainder of his days, or he must submit to an operation, to perform which, in a satisfactory manner, requires the utmost exertion of skill on the part of the surgeon, and of which even then nothing better can be said than that it is the only thing which, under his peculiar circumstances, affords him a reasonable prospect of relief. The object of the operation is to make an artificial communication between the anterior and posterior portions of the urethra (so as to supply the place of that part of the canal which is deficient) through which the urine may flow instead of escaping by the fistulous opening in the perineum. I cannot explain what I have to say on this subject better than by giving a brief history of a case which I have lately attended with Mr. Baker of Bulstrode Street.

A young man, in making a leap on horseback, received a violent blow on the perineum from the pummel of the saddle. The immediate consequence of the injury was hæmorrhage from the urethra, and this was followed by extravasation of urine and sloughing of the perineum to a considerable extent. A catheter was at first introduced into the bladder, but it was afterwards removed. The sloughs having separated, the sore in the perineum gradually closed, a small

fistulous opening only being left immediately behind the scrotum, through which the whole of the urine was discharged. He was in this state seven months after the occurrence of the accident, when he arrived in London, and Mr. Baker advised him to have my opinion on his case.

On introducing an instrument into the urethra I found an obstruction of the canal immediately below the pubes. Several ineffectual attempts having been made to penetrate the obstruction in the usual manner by bougies and sounds of various sizes, I had recourse to the following operation:—The patient having been placed in the same position as in lithotomy, a staff was introduced into the urethra, and held by Mr. Hilles, who, with Mr. Baker, assisted me in the operation, with the extremity of it resting against the obstruction. I then made an incision in the perineum, extending backwards from the part in which the staff was to be felt, in the direction towards the prostrate gland. It was now evident that not less than three quarters of an inch of the urethra was deficient below the pubes; the place of it being occupied by a rigid cicatrix. This having been divided longitudinally by the point of the scalpel, I was enabled, though not without some difficulty, to pass the staff from the part at which the extremity of it rested, into the sound portion of the urethra towards the bladder, and then into the bladder itself. The staff was then withdrawn, and an elastic gum catheter having been substituted for it, the latter was allowed to remain in the urethra and bladder. On the ninth day after the operation, there being some degree of irritation at the neck of the bladder, the catheter was removed, being reintroduced, however, after two days more. From this time it was removed at intervals, which were sometimes longer, sometimes shorter, according to circumstances. The wound in the perineum gradually healed, and in less than ten weeks from the time of the operation was reduced to the diameter of a small pea. The patient was now able to introduce a silver catheter of the size of his urethra into the bladder without difficulty, and he repeated this operation so as to draw off his urine three or four times daily. When he voided his urine without the catheter, by placing the point of his finger on the opening in the perineum, he was enabled to discharge the whole in a sufficient stream by the urethra.*

*The last report which I had of this patient was six months after the operation, and to this effect: "that he had continued to improve, and expected in the course of a fortnight to be as well as ever."

Since the manuscript of this lecture was prepared for the press, a case very similar to that described above has come under my care, in the person of a young man nineteen years of age. He had received an injury of the perineum in leaping over a gate about a year ago. Three quarters of an inch of the urethra below the pubes seemed to be deficient. I made an artificial canal, joining the anterior and posterior portions of the urethra to each other, by perforating the cicatrix with the instrument having the concealed lancet, described at page 60, leaving an elastic gum catheter in the urethra and bladder afterwards. At this time about ten weeks after the operation, the patient voids his urine by the urethra in a full stream, without pain or difficulty, no more than a few drops escaping by the opening in the perineum. A common plaster bougie may be introduced readily into the bladder. Mr. Guthrie saw this patient with me, and lent me his assistance at the operation.

LECTURE V.

On some other Diseases of the Male Urethra.

THERE are some other diseases of the male urethra which, in a greater or less degree, obstruct the flow of urine, but which are to be distinguished from that disease to which our attention has been hitherto directed.

In cases of ulcers of the glans including the whole circumference of the orifice of the urethra, as the ulcer heals, the orifice becomes contracted, so that when the healing process is completed the stream of urine is much reduced in size. But this is not all. The contraction, if left to itself, goes on increasing, until at last there is a complete retention of urine, and it is very probable that you are not called in until this last stage of the disease.

The management of the case, in some instances, is rendered more complicated by the circumstance of the præpuce having contracted partial adhesions to the surface of the glands, at the same time that there is a complete phimosis. Where this complication exists, you must begin with dividing or slitting up the præpuce. You then find the exposed surface of the glands, in all probability, presenting the appearance of an irregular cicatrix, in which you at last discover, but not without a minute inspection, the contracted orifice of the urethra. Into this orifice introduce a small silver probe, such as is made to be inserted into the *punctum lachrymale* of the eyelid. Having withdrawn this, introduce another probe of a somewhat larger size; then one a little larger still; and afterwards insert a common silver director passing it as far as one or two inches into the urethra. This will enable the patient to make water, the urine flowing along the groove of the director. After the bladder is emptied, introduce the point of a straight bistoury along the groove of the director, and divide the contracted orifice of the urethra. Let the patient retain a gum catheter in the urethra and bladder until the incision is nearly healed. He will then make water without the smallest difficulty or impediment: but the cicatrix has the same disposition to contract as before; and, in order to prevent the contraction again taking place, a bougie about two inches long should be introduced into the urethra every morning, and allowed to remain there for five or ten minutes.

The urethra is, as you well know, surrounded by mucous follicles, which secrete a mucus by which the canal is lubricated. In some cases, one of these follicles becomes converted into a small indurated tumor, varying from the size of a hempseed to that of a horse-bean. Such a tumor is to be felt, imbedded, as it were, in the *corpus spongiosum*. The usual situation of it is about two or three inches from the external orifice, but it is sometimes perceptible close to the fraenum, and at other times within the scrotum. The disease undoubtedly originates in inflammation; but, being once established, the tumor may remain unaltered after all symptoms of active inflammation have

subsided. If it be very small, it gives the patient little or no inconvenience; but otherwise, it torments him by producing chordee, and by keeping up a constant gleety discharge from the urethra. In many cases, in which what is called a gleet continues unabated for a great length of time, this depends on the irritation kept up in the urethra by one of these enlarged and indurated follicles. For the most part, it is better to allow the disease to take its own course. The tumor may disappear in the course of a few weeks or months. If it should not do so, you may then endeavor to reduce it by the external application of the *unguentum hydragyri* with camphor; or by keeping the patient in bed, with a gum catheter in the urethra and bladder. This plan may be pursued for a few days each time, and repeated at intervals until the tumor is nearly dispersed. The gum catheter should be of a small size: a large one will produce an effect exactly contrary to what you wish, irritating the gland, and exciting a fresh attack of inflammation in it. I have known the attempt made to destroy one of these enlarged follicles by means of the bougie armed with the nitrate of silver; but in the cases to which I allude the treatment seemed to be injurious rather than beneficial. It has often occurred to me that the tumor, when not of a very large size, and not very closely attached to the surrounding parts, might be dissected out without injury to the *corpus spongiosum* or urethra; but I have never yet performed such an operation. In some instances suppuration takes place in one of these tumors, and an abscess bursts externally. The healing of the abscess is generally slow; and after it has healed, an induration remains, which, however, gradually disappears. In other cases it bursts internally, and the cavity of it is liable to become distended by a portion of the urine finding its way into it. Under these circumstances you may direct the patient to place his finger on the part when he makes water, so as to make a moderate pressure on it. Thus the urine will be prevented entering the abscess, which will at last, in all probability, heal. If, however, it should not heal, you may introduce a director into the urethra, and then make an incision in it so as to establish a free external opening, leading to the centre of the abscess, dressing the parts afterwards with some stimulating ointment, and applying occasionally the nitrate of silver.

I have seen one case, in which one of these enlarged glands produced a complete obstruction of the urethra, and a retention of urine. The urethra became ulcerated behind the obstruction; the ulceration extended to the external parts, and the urine became extravasated into the cellular membrane of the scrotum and penis. The patient was admitted into the hospital with extensive mortification of these parts, and died. The examination of the body after death enabled me to ascertain the nature of the disease.

Diseases of the Female Urethra.

Passing over those affections of the male urethra which are connected with syphilis and gonorrhœa, I shall draw your attention to the

diseases of the female urethra. These are few and simple, and, as I have already had occasion to observe, all that is to be said respecting them may be comprised in a very few words.

Stricture of the female urethra is very rare; nor have I ever seen it except at, or immediately within, the external meatus. I have a preparation which affords an example of stricture in this situation. It was taken from the body of a woman who died under the following circumstances :—She was admitted into the hospital labouring under a very great difficulty of making water. The urine was voided almost in drops, with much effort and straining. On examination, I found the external orifice of the urethra so much contracted that it would scarcely admit a small probe. It was, however, dilated by means of bougies, and the patient voided her urine in a moderate stream. Some time afterwards she was seized with an attack of fever, which proved to be dependent on inflammation of the peritonæum covering the liver, unconnected with the stricture, and of this she died. You will observe in the preparation taken from this patient that the stricture is quite at the extremity of the urethra, occupying about half an inch of the canal.

Sir Charles Clarke has described another disease of the female urethra, of which many examples have come under my own observation. It consists of a tumor, or excrescence, having its origin from the urethra immediately within the external meatus. The tumor projects externally; is of a soft texture; of a bright scarlet color; possessed of exquisite sensibility; and it varies in size from that of large pin's head to the size of a horse-bean. It may be removed by the probe-pointed scissors, the basis of it being afterward destroyed with the caustic potass; or it may be removed by the application of a ligature. The first of these methods is that which I have myself adopted, and which my own experience in these cases would induce me to prefer. Cut off the tumor first as close to the base as possible; wait until the bleeding has ceased, and then apply the *potassa fusa* for a short time to the cut surface. I have contrived an instrument which you will find it very convenient to employ where you have recourse to this operation. It is a silver tube, incomplete in one part of its circumference; so that, when introduced into the urethra, it allows the caustic to be applied to the tumor, while the sound part of the urethra is defended from it. On these, as on other occasions, where you employ the caustic potass, you should take care that it is of the very best quality, and recently made; and after you have applied it, the parts in the neighborhood should be bathed with vinegar, which will neutralize the caustic alkali, and prevent it acting where the action of it is not required.

In some of these cases, instead of the caustic potass, I have applied the concentrated nitric acid, by means of a probe armed with lint and dipped in the acid; defending the neighboring parts by washing them with the solution of the bicarbonate of potass; and I do not, indeed, know that either one of these caustics is preferable to the other.

Irritable Bladder.

In the greater number of cases of disease of the bladder, the most marked symptom under which the patient labors is a too frequent inclination to void the urine. The bladder is irritable; and those who have not combined with the observation of symptoms the study of morbid anatomy are apt to confound with each other diseases which are essentially different, under the general appellation of irritable bladder. In the observations which I am about to make, however, I shall apply the term irritable bladder to those cases only in which the irritability is not the consequence either of inflammation or of organic disease.

If healthy urine escapes from the bladder, and comes in contact with other textures, the peritonæum, for example, or the cellular membrane, it acts on these parts as a violent stimulus, inducing inflammation, gangrene, and death: while to the bladder it is no stimulus at all; the patient suffering no more inconvenience from it than he would have suffered if the bladder had been distended with the same quantity of water. If, however, there be any derangement of the functions of the general system, or of the kidneys in consequence of which the chemical qualities of the urine are altered, it then becomes a stimulus to the bladder itself; and the patient, under these circumstances, suffers inconvenience, and feels the desire to expel the contents of the bladder, when there is only a small quantity of urine collected in it. In some of these cases the urine contains an unusual quantity of lithate of ammonia, which is deposited, on cooling, mixed with other matter, in the form of a red or yellow uncrystalized sediment; or it may contain the pure lithic acid, showing itself in the form of a red sand. In other cases the urine is alkaline, having the odor of ammonia and depositing white crystals of the triple phosphate of ammonia and magnesia. It is right that I should notice these cases at present, though it be only in a brief manner. For farther information respecting them, and the treatment which they require, I must refer you to some of my subsequent Lectures relating to calculous affections.

Irritability of the bladder is occasionally a symptom of disease in, or of disease affecting, the nervous system. An elderly man, for example, complains of frequent attacks of giddiness. Sometimes, in walking, his head turns round, so that he is in danger of falling; and this symptom, probably, arises from an altered structure of the arteries of the brain, causing an imperfect state of the cerebral circulation. This state of things is sometimes attended with an irritable condition of the bladder; and although the urine is of a healthy quality, and the bladder itself is free from disease, the patient is tormented by a constant micturition, voiding his urine without pain, but at short intervals, and in small quantity at a time. You can do little for the patient's relief in such a case as this; but it is important that you should understand its real nature, so that, if you cannot effect a cure, you may avoid tormenting him with useless remedies.

Irritability of the bladder is at other times the result of mere nervousness; of the same state of the nervous system, as, in some other individuals, occasions a constant winking of the eyes, or twiches of the muscles or other parts. The frequent expulsion of the urine, being once begun, is kept up by habit; the bladder becomes less capacious than it ought to be; and it is not until after a lapse of time, nor without some effort on the part of the patient, that it is restored to its natural condition.

There are others, who have a tendency to diabetes, and who, overlooking the too abundant secretion of urine, and observing only the too frequent inclination to expel it, consult you under the impression that they labor under a disease of the bladder, while the actual disease is in the kidneys, or rather in the general system. Now, these things may appear too trivial, or too obvious, to be worthy of being mentioned; but I have known them to be a source of error; and I am anxious that, when you meet with such cases, you should not be perplexed in forming your diagnosis.

Paralysis of the Bladder.

Injuries and diseases of the brain and spinal marrow, which render the limbs paralytic, may render the bladder paralytic also. The bladder is not unfrequently affected in the same manner in cases of typhus fever, or where there is a great general excitement in consequence of a compound fracture, or other severe local injury, especially of the lower extremities.

Retention of urine from paralysis of the bladder is attended with symptoms which are, in many respects, different from those which occur where the retention arises from mechanical obstruction. The same diminution of nervous influence, which renders the bladder incapable of expelling the urine, renders it also insensible to its stimulus. Hence it is, that the accumulation of the urine in the bladder is productive of no actual suffering, and of comparatively little inconvenience. When a great degree of distension has taken place, the contents of the bladder begin to escape involuntarily; and this involuntary flow of urine continues, o as to prevent further accumulation, but not so as to empty the bladder. Being made acquainted with the circumstances which I have just mentioned, you will understand how it is that this kind of retention of urine is not unfrequently overlooked, especially in the cases of corpulent individuals, in whom the bladder may be distended to a considerable size before it can be distinguished by the hand above the pubes.

In some instances, although the bladder has lost its contractile power, the patient is able, nevertheless to get rid of a portion of its contents, in a stream, by his own natural efforts. This is accomplished by means of the action of the abdominal muscles, but not until the bladder has become enormously distended. Here the urine is expelled at short intervals, slowly, and in small quantity at a time. The patient be-

lieves the bladder to be empty, as he probably voids as many ounces of urine as are usually voided in twenty-four hours; and he is surprised to find, on the introduction of the catheter, that it draws off three or four pints, or even a larger quantity. Where this state of things has existed for a considerable time, if the patient dies, and you have the opportunity of instituting a *post-mortem* examination, you find the bladder very much dilated, the mucous membrane of a pale color, and the muscular tunic much attenuated.

Where the bladder is affected with paralysis, the patient is to be relieved by means of the catheter: and this is easily accomplished; there being no mechanical impediment to the introduction of the instrument. The operation must be repeated at stated intervals, at the same time that you attempt, by suitable remedies, to remove the cause of the paralysis, whatever it may be.

But it may be reasonable to inquire what will happen if the catheter be not employed. I have known such a retention of urine to exist, some urine escaping, but the bladder remaining distended, without the real nature of the case having been understood, for a great length of time; that is, for many months, or even for one or two years. The same overloaded state of the bladder is a still more frequent consequence of the chronic enlargement of the prostate gland, to which elderly persons are liable, as I shall explain to you hereafter. From whichever of these causes it arises, it produces the same effects. The kidneys become diseased; they secrete at first albuminous, and afterwards purulent urine; and other changes are produced in these organs which I need not describe at present, as they will be fully explained hereafter.

Paralysis of the bladder is usually the result of some disease or injury, which affects other muscles as well as that of the bladder. Occasionally, however, it occurs without this complication; the bladder, and (as far as we can see) the bladder only, being deprived of its power of action. A gentleman, a lawyer by profession, of sedentary habits, and of what is commonly called a nervous temperament, observed that he had not the usual desire to void his urine, and that when he did void it, it was in a very slow stream, and in small quantity. On the following day he voided none at all, but he had, at the same time, no inclination to void it, and, therefore, did not suffer. Another day arrived, and, being still in the same condition, he thought it prudent to consult a surgeon; not because he experienced either pain or inconvenience, but because he knew, as he expressed it, that all could not be right. The surgeon introduced a catheter, which entered the bladder without the smallest difficulty, and drew off a large wash-hand-basinful of urine. The urine soon became again collected in the bladder, and the catheter was again had recourse to. The operation was repeated night and morning for a few days, at the end of which time the patient regained the power of making water, and was soon able to evacuate the contents of his bladder as usual. Some time afterwards he had another similar attack, from which he recovered more slowly than from the former one.

The paralytic affection of the bladder, which occurs in hysterical females, is of a peculiar kind, and deserves a separate consideration. It appears to me that the symptoms are to be traced to a still higher source than in ordinary cases of paralysis; that, in the first instance, it is not that the nerves are rendered incapable of conveying the stimulus of volition, but that the effort of volition is itself wanting; and this corresponds with what is observed in cases of loss of voice, and in many other diseases connected with hysteria. As the distension of the bladder increases, the patient begins to be uneasy, and at last suffers actual pain; and as soon as this happens, the volition is exercised as usual, and the bladder begins to expel its contents.

Thus, if the bladder be not relieved artificially, by the introduction of the catheter, the hysterical retention of urine is usually of short duration. If, however, the catheter be had recourse to, the natural cure is prevented, and the existence of the disease may be prolonged for an indefinite period of time—for weeks or even for months. The general rule to be observed in the treatment of these cases is to interfere but little. You may administer an active aperient, or an assafœtida by the mouth, but you should avoid using the catheter. This general rule, however, is not without its exceptions. In a few of these cases, where the bladder has been very much distended, the consequence of this over-distension is, that it loses its power of contraction, and even though the patient endeavors to make water, no urine flows. Under these circumstances it is evident that artificial relief is necessary; and if it be not afforded, more than a simple inconvenience may be the result. A young woman was admitted into St. George's Hospital, in November, 1814, labouring under a train of symptoms which I believe to have been connected with the same condition of the nervous system as that which produces the phenomena of hysteria. I should be wandering from my subject, if I were to relate to you all the circumstances of this interesting and important case. It is sufficient for our present purpose that you should be informed that one of the symptoms was a retention of urine, which had been long neglected, and which existed to such an extent that forty ounces of urine were drawn off by the catheter; and that the patient ultimately died. In my notes I find the following account of the appearances which the bladder presented in the *post-mortem* examination:—"It was of a very large size, as if it had been for a long time unusually dilated. It was throughout of a dark color almost black. There were only some slight vestiges of its natural structure left; the muscular fibres being very much wasted, and the internal membrane presenting the appearance of a very thin film, which was readily separated from the parts below. The dark color of the bladder did not seem to arise from mortification, since there was neither fœtor, nor any other mark of putrefaction." The state of the bladder was, indeed, very peculiar; not resembling any thing which has fallen under my observation either before or since.

Inflammation of the Bladder.

You will find in practice that acute inflammation of the bladder is of much less common occurrence than you would suppose it to be, from what is said on the subject by nosological writers. Cases of retention of urine, and cases of inflammation of the prostate gland, are not unfrequently mistaken for it by persons who are not very conversant with the diseases of the urinary organs.

Acute inflammation of the bladder, does, however, occur sometimes. You have especially the opportunity of seeing it in cases of gonorrhœa. Where there is a sudden suppression of the discharge from the urethra, the metastasis takes place, sometimes to the testicle, sometimes to the prostate gland; at other times, but less frequently, to the mucous membrane of the bladder. The patient has a frequent desire to void his urine, with a sensation as if there were urine in the bladder, when there is really no urine in it; and he strains to make water, with the bladder empty. There is pain referred to the region of the pubes and perineum. The urine deposits a sediment, which is of a different character in different cases, as I shall explain hereafter. The pulse is frequent, the tongue furred, and there is a good deal of constitutional excitement. These symptoms may continue for several days; and in cases of gonorrhœa they do not usually subside until the purulent discharge from the urethra is restored.

The disease is to be combated by taking blood from the arm, or from the loins by cupping, or from the lower part of the abdomen by leeches. The patient should be confined to bed and the horizontal posture. His bowels should be kept open by occasional doses of castor oil. Opium may be administered with advantage, especially in the form of clysters. Sometimes the urine retains its acid quality, turning the blue litmus paper red; and the sediment, which it deposits is of a yellowish color, having no adhesive quality, and bearing some degree of resemblance to pus; and in these cases, if I am not much mistaken, the patient will derive benefit from the use of mercury,—two grains of calomel, and half a grain of opium, being administered twice or three times daily. In other cases the urine is alkaline, turning the reddened litmus paper blue, and depositing a small quantity of adhesive mucus of a brownish color; and, under these circumstances, I have known much good to arise from the use of the *vinum colchici*, fifteen or twenty minims being given three times daily, for three or four successive days.

Chronic inflammation of the bladder occurs very frequently as a secondary disease, depending on long-continued stricture of the urethra, disease of the prostate gland or kidneys, or stone in the bladder. Women are also liable to it, in whom there exists an ulcerated communication between the bladder and vagina. As a primary affection it is comparatively rare. However, it occurs as such sometimes; and I have seen a few patients in whom it had existed for a considerable length of time, and could not be traced to any other disease.

I shall describe to you, first, the appearance which the diseased parts exhibit on dissection; secondly, the symptoms which the disease produces; and, lastly, the treatment which it requires.

The mucous membrane is of a dark red color, in consequence of its numerous vessels ramifying it on its surface, injected with their own blood. As the disease proceeds, the discoloration becomes greater, until, at last, the mucous membrane appears almost black from the turgid state of the vessels; at the same time that it is somewhat thickened and pulpy to the touch. The inflammation extends up the membrane of the ureters; which, in their turn, assume much the same appearance with the bladder itself. The pelvis of each kidney, and the processes of the pelvis, or infundibula, become inflamed also: and these, as well as the ureters, are generally dilated, so as to be more capacious than natural. This dilatation is greatest where there has been a long continued difficulty in expelling the urine from the bladder; but it exists in other cases also, though in a less degree. In the advanced stage of the disease the inflammation is found to have extended to the glandular structure of the kidneys; and these organs become not only more vascular than natural, but enlarged in size, and of a soft consistence, even approaching in appearance to that of a medullary tumor. Collections of muco-purulent fluid, tinged brown with grumous blood, and offensive to the smell, are sometimes found in the dilated infundibula; at other times there are distinct abscesses in the glandular structure. In cases where the disease is still farther advanced, before the patient dies, we find that the inflammation has extended to the muscular tunic of the bladder, and to the loose cellular membrane by which the bladder is surrounded. Then coagulated albumen is deposited in the cellular texture; not unfrequently small putrid abscesses are formed in it; and sometimes it is found after death in a state of slough, or approaching to it. Occasionally, but rarely, ulceration takes place on the inner surface of the bladder, and sometimes to a very great extent. A patient, about fifty years of age, died in St George's Hospital, labouring under the symptoms which I am about to describe. On examining the body, the mucous membrane was found destroyed every where, except a very small portion near the neck of the bladder. The muscular fibres were as distinctly exposed as they could have been by the most careful dissection. The prostate gland in this case was slightly enlarged; the membrane of the ureters and pelves of the kidneys were much inflamed, and the ureters were dilated. I remember a preparation, exhibiting nearly the same appearances, in Dr. William Hunter's Museum, which was formerly in Windmill Street, but which is now in Glasgow.

As chronic inflammation of the bladder is, in the majority of cases, not a primary but a secondary affection, the symptoms of it are generally blended with those of another disease, as of stone in the bladder in one case; of stricture in the urethra, or enlargement of the prostate, in another case. I shall endeavour to describe the symptoms as nearly as I can, distinct from those of the diseases which it accom-

panies, such as you find them to be in those cases, in which the inflammation of the bladder is the only existing malady.

The patient has frequent desire to void his urine, and the urine deposits, as it cools, a thick adhesive mucus, which clings to the bottom of the vessel. This mucus is of a greyish colour, streaked with white, and sometimes tinged with blood. There is pain previously to making water, and also while the urine flows. These symptoms may continue for a great length of time without becoming very urgent. However, they gradually increase, until the irritation of the bladder becomes excessive, and the quantity of mucus deposited is so great, as in some cases to be nearly equal the urine itself. In this last respect, however, there is a great difference in different cases. The urine ultimately assumes a brownish hue, and is of a most offensive ammoniacal odor. The extension of the inflammation to the glandular structure of the kidneys is indicated by the access of a still more formidable train of symptoms. The patient has shiverings; is troubled with sickness and vomiting, with cold extremities and great prostration of strength; his pulse becomes irregular and intermitting; his tongue brown; he sinks, and dies. In the case which I mentioned, in which the bladder was extensively ulcerated, there was excruciating pain referred to the perineum and urethra, especially after making water; and the introduction of a sound into the bladder occasioned excessive torment. The symptoms which existed in the patient whose ulcerated bladder is preserved in Dr. William Hunter's Museum, are thus described in Dr. Hunter's Catalogue:—"Great pain and scalding in voiding the urine, a discharge of pus, and occasionally of blood."

The mucus, which is deposited by the urine in these cases, deserves our especial notice. It is thick and viscid, clinging to the bottom of the vessel, and hanging down in the form of long ropes, when you attempt to pour it from one vessel to another. It is highly alkaline, turning the tumeric paper immediately brown. When small in quantity, although the mucus is alkaline, the urine often remains acid, as has been observed by Dr. Prout; but when the quantity of mucus is large, it imparts its alkaline quality to the whole of the urine, which, under these circumstances, is liable to deposit calculous matter, composed of phosphate of lime, in small masses, of the consistence of recently made mortar. It is the formation of this peculiar mucus which led the old physicians and surgeons to apply to this disease the name of *catarrhus vesicæ*. It may appear remarkable that the mucous membrane of the bladder, when in a state of inflammation, should secrete this peculiar mucus, while that of the urethra, under the same circumstances, secretes a fluid which cannot be distinguished from true pus. The very interesting researches of Dr. Babington, however, recorded in the second volume of the "Guy's Hospital Reports," go far towards explaining this anomaly, by showing that the pus from a common abscess assumes all the characters of this kind of mucus on the addition of an alkali.

In treatment of chronic inflammation of the bladder, you are to consider whether it be a primary or secondary affection; and if the

latter, the first thing to be done is, that you should remove or palliate the original complaint. If there be a stricture, you are to dilate it: if there be a stone in the bladder, you will in vain endeavor to remove the inflammation, without removing the stone, which has produced it: if there be a disease in the prostate gland, you are to resort to the plan of treatment which I shall describe to you in a future Lecture.

But even in these cases something may be done by other means towards relieving the affection of the bladder; and where this is the original disease, of course these other means are all on which you are to depend.

Let the patient remain as much as possible in the horizontal posture. When he sits or stands, there is the weight of the whole column of blood, from the head to the pelvis, pressing on the vessels of the bladder; and blood-vessels become distended, which are comparatively empty when he lies down. The horizontal position is as important in diseases of the bladder as it is in diseases of the uterus; as important as an elevated posture and a high pillow are in cases of determination of blood to the head; and its importance rests on precisely the same principle.

Opium agrees remarkably well with patients who labor under chronic inflammation of the bladder. It may be administered by the mouth, or in the form of an enema at bedtime; and other sedatives, as the extract of hyoscyamus, or lettuce, or poppies, may be administered besides, if necessary. The bowels should be kept in an open state, but no violent or drastic purgatives should be exhibited. Mercurial remedies, whether given in the form of alteratives or in larger doses, so as to affect the constitution, are certainly not beneficial, and are often injurious.

In a very few instances where the digestion is impaired, small doses of alkalies combined with light bitters may be exhibited with advantage; but the extensive use of alkalies is prejudicial, causing the urine to become more alkaline, and the phosphatic salts to be deposited in larger quantities than before.

The *uva ursi* has the reputation of being useful as a remedy for chronic inflammation of the bladder. I must say, however, that this remedy has generally disappointed me in these cases, and that I have not seen those advantages produced by it, which the general reputation of the medicine had led me to expect. I have seen much more good done by a very old medicine, which has been long ignominiously but unjustly, expelled from the Pharmacopœia of the College of Physicians, namely, the root of the *pareira brava;* and with regard to this, I am satisfied that it has a great influence over the disease, which is now under our consideration, lessening very materially the secretion of the ropy mucus, which is in itself a very great evil, and, I believe, diminishing the inflammation of the bladder also. It may be exhibited in the following manner:—Take half an ounce of the root of the *pareira brava*, add three pints of water, let it simmer gently, near the

fire, until reduced to one pint*. The patient is to drink from eight to twelve ounces of the decoction daily. If so large a quantity of liquid should be offensive to the patient's stomach, he may take the extract of *pareira brava* instead, twenty-five or thirty grains being equal to half a pint of the decoction. You may add to it moderate doses of the tincture of hyoscyamus; and in those cases in which there is a deposit of the phosphates, you may also add some of the muriatic or nitric acid. Very small doses of turpentine are sometimes beneficial in these cases. You may begin with one or two grains of Chios turpentine administered twice daily, giving a somewhat larger quantity afterwards. I have often known the symptoms to be much alleviated under the use of the cubebs pepper; but it must be given only in small quantities. When given in large doses I believe it to be actually injurious. I was consulted by a gentleman who labored under chronic inflammation of the bladder, and I prescribed for him fifteen grains of the powdered cubebs to be taken every eight hours. He was very much relieved, so much so, that he began to look forward to his recovery. Being anxious to expedite his cure, of his own accord, and without my knowledge, he took the cubebs in larger (I believe in dram doses.) This was followed not by a diminution, but by an aggravation of all his symptoms. The irritation of the bladder was much increased, the mucus was secreted in a much larger quantity than before, and ultimately the patient died; his death being, I will not say occasioned, but apparently very much hastened, by his imprudence in overdosing himself with the cubebs.

The bladder is accessible to local applications, and the question will here arise, "Can nothing be done for the patient by means of remedies of this description?" The following are the results of my experience on this subject.

In aggravated cases of the disease, where the symptoms are at their greatest height, the mildest injections, even those of tepid water, will do harm rather than good. They are especially to be avoided where the mucus deposited by the urine is highly tinged with blood. When however the symptoms have in some degree abated, the injection of tepid water or decoction of poppies is in many instances productive of excellent effects. An elastic gum catheter may be introduced into the bladder; and the injection may be made by means of a small elastic gum syringe. The liquid should be allowed to remain in the bladder about thirty or forty seconds, and not more than an ounce and a half, or two ounces, should be injected at each time. If the bladder be distended, so as to occasion any considerable degree af pain, the effect is always injurious instead of being beneficial. This operation may be repeated, according to circumstances, once or twice in twenty-four hours.

When there is a further abatement of the symptoms, the disease

* The infusion of *pareira brava*, which has been introduced into the last Pharmacopœia of the College of Physicians, does not at all answer the purpose of the decoction and is nearly useless.

having assumed a still more chronic form, and the mucus being free (except on extraordinary occasions) from all admixture of blood, we may venture to add to the injection a very small quantity of nitric acid. At first the proportion ought to be not more than that of one minim of the contracted, or ten minims of the diluted nitric acid, to two ounces of distilled water; but afterwards this proportion may be doubled. I do not say that it should never be increased still further, but I have observed, that for the most part injections, which are stronger than this, are not only not useful but actually prejudicial. In having recourse to this mode of treatment, it is better to wash out the bladder first with a little tepid water; then to inject the acid solution, allowing it to remain for not more than thirty seconds in the bladder. At first the operation should not be repeated oftener than once in every two days; afterwards it may be repeated once daily, but never more frequently than this. If the urine drawn off by the catheter be tinged with blood, the injection should be deferred to the following day; and if the injection be at any time followed by pain, and other symptoms indicating an increase of inflammation, ought not to be had recourse to again until these have subsided.

I was first led to adopt the use of the injections of nitric acid in the year 1826; and from the experience which I have now had of them, I do not hesitate to say, that, with the precautions which I have suggested, be properly observed, they will be found to form a valuable addition to our stock of remedies to be employed in these cases. They are useful not only where the chronic inflammation is the primary disease, but also where it occurs as a secondary affection, the result of a calculus in the bladder, or of a chronic enlargement of the prostate gland.

It may be observed that, although treating of a chronic inflammation of a mucous membrane, I have not hitherto recommended the abstraction of blood. I have, however, had recourse to it in many instances, generally by means of the application of cupping glasses to the loins. I will not say that it has never been beneficial, but it is my duty to say also, that I have much more frequently found it to be injurious. However contrary it may seem to be to the principles on which the treatment of inflammatory diseases is generally to be conducted, I am satisfied that in those cases of inflammation of the bladder in which the mucous membrane secretes a considerable quantity of thick, tenacious, ropy mucus, falling to the bottom of the urine, the rule of practice should be, not to take away blood; and that this admits of very few exceptions. In fact, this species of vesical inflammation is, in the great majority of cases, combined, in some way or another, with great debility of the general system, and the patient requires (for the most part) that his bodily powers should be supported, rather than that any demand should be made upon them. I may refer you to my Lectures on Calculous Disorders for some observations in further illustration of this subject.

In speaking of inflammation of the bladder, I have considered it as being either of the acute or chronic kind; not only in compliance

with general custom, but because I could not otherwise so conveniently express all that is required to be said on the subject. At the same time it is right for you to bear in mind, not only on this, but also on other occasions, that, however useful it may be to make it, this distinction is really artificial. The boundaries of acute and chronic inflammation are not well defined. There are numerous cases in which we must hesitate to determine whether they may with most propriety be refered to one class or to the other; and there are other cases, which, while, at one period, they exhibit all the marks of acute inflammation, exhibit, at another period, those of chronic inflammation with equal distinctness.

Incontinence of Urine.

By incontinence of urine, I intend to express an involuntary escape of urine from the bladder; a state of things entirely different from the constant discharges of urine which take place in cases of irritable bladder, where each discharge is the result of a distinct act of volition, excited by pain, or in some other way.

Incontinence of urine may be the result of mechanical injury; thus it occasionally follows the operation of lithotomy in the male, and very frequently follows it in the female sex. In women also it not uncommonly is the consequence of difficult parturition with a distended bladder, where the pressure of the child has caused sloughing of the vagina, and thus laid the foundation of a communication between it and the neck of the bladder.

The most frequent cause of incontinence of urine, however, in the male sex, is an over distended bladder. When the patient is unable to void his urine voluntarily, after a certain quantity is collected in it, the overplus is discharged involuntarily, and thus it is that this symptom occurs in cases of long-standing stricture of the urethra, of enlarged prostate gland; and of paralysis affecting the lower part of the body. The patient, and those about him, suppose the bladder to be empty, because the urine is always dribbling from him. But this very circumstance leads the surgeon to suspect the contrary; and accordingly, on examining the abdomen, he discovers an enormous tumor, formed by the distended bladder, occupying the hypogastric region, and extending upwards, perhaps as high as the navel. The remedy for this kind of incontinence is sufficiently obvious; nothing more being required than that the bladder should be emptied artificially at stated periods. In cases of stricture of the urethra, indeed, this cannot be always accomplished in the first instance; but the dilatation of the stricture, even to a very moderate extent, by the introduction of a small bougie, will often be sufficient to give much, if not complete, relief.

There are some cases of paralysis in which there is incontinence of urine although the bladder is empty, as if the same cause which rendered the lower limbs paralytic rendered the bladder incapable of distension. For example, a gentleman, sixty-three years of age, swal-

lowed by mistake a bottle of liniment, of which the tincture of cantharides was a principal ingredient. In about three quarters of an hour an emetic was administered; nevertheless he was immediately afterwards affected with paralysis of the lower extremities, and inability to void his urine. For the first fortnight he was under the necessity of having his urine drawn off at stated periods. After this he regained the power of making water, but was tormented by an incessant desire to do so. When I was consulted, four years after the commencement of the attack, he was able to walk with the assistance of crutches. At times he had a sudden and irresistable impulse to void his urine, and expelled a small quantity by a voluntary effort; but at other times it flowed involuntarily without his being conscious of what happened, so that his clothes were as wet as possible. On introducing a catheter, I found that the bladder was empty. It may be supposed, that in this case something was to be attributed to the peculiar nature of the stimulus which had been swallowed. I have, however, observed the same thing in some cases of paralysis of the lower limbs, arising from other causes. I have occasionally seen what was called a case of incontinence of urine in young women having a disposition to hysteria: but from a close observation of such cases, I am led to believe, that the discharge of urine, although involuntary in appearance, is not involuntary in reality; and that this symptom, like many other hysterical symptoms, is to be referred to a mis-direction of the power of volition, and not to the actual want of it. The case which I am about to mention seems to confirm this view of the subject. A lady, twenty years of age, for the last ten or eleven years had been troubled with a constant discharge of urine. It flowed (as she said) without her being able to prevent it while she sat in her chair, and while she was walking ; so that she was quite unfit to live in society, or even in her own family. All the plans of treatment, recommended by myself and others, proved inefficacious. At last, on account of this infirmity, it was thought advisable that she should be separated from the rest of the family, and she was sent to reside at a distance from them. After some time she was seized with an urgent desire to return home, and immediately she regained the power of retaining her urine. She continued well when I heard of her some time afterwards.

I have no doubt that the incontinence of urine during the night, which occurs so frequently in children, is, for the most part, in its origin, not altogether involuntary. But it soon becomes confirmed by habit, and then the discharge is preceded by so slight an effort of volition, that the patient is scarcely conscious of it afterwards. It is reasonable to suppose, that those children whose urine is of a too stimulating quality, in consequence of an excess of lithic acid in it, may be more liable to this kind of incontinence than others; yet I must say, that my endeavors to relieve it by the exhibition of alkalies and purgatives, combined with a regulated diet, have been generally unsuccessful. A blister applied over the *os sacrum*, and repeated according to circumstances, is a more effectual remedy. Sir Charles

Bell has observed, that children are more liable to this troublesome symptom when they lie on their back than when they lie on the face or side. This may explain, in part at least, the good arising from the blister. The same object may be attained by making the child wear, during the night, a machine, so contrived as to prevent him lying in the supine posture.* I do not know that you can absolutely rely on this method for the patient's cure, but it may often be employed advantageously, in combination with other methods of treatment. In some cases, the discharge of urine is periodical, returning at the same hour of the night and morning. You may then direct the nurse to take the child out of bed, so as to give him the opportunity of making water about an hour before; or if the patient be older, he may be provided with a clock, having a loud alarum, for the purpose of awakening him from his sleep at the proper moment. Under the same circumstances, the sulphate of quinine may be administeied with great advantage. But in no instance are any of these remedies likely to be successful, unless the patient himself feels a strong desire to be relieved; and unfortunately this desire is too often wanting, long habit gradually reconciling the mind to this, as it does to many other inconveniences, until, at last, it seems to be a matter of indifference whether relief is obtained or not. I have heard of young persons being cured of this kind of incontinence of urine by applying caustic to the neck of the bladder, and by the introduction of bougies or catheters. If these methods of treatment produce ony effect, I suspect that it is simply by annoying the patient, and by giving him that strong desire to be relieved, which I have just mentioned as the first step towards recovery.

LECTURE IV.

Fungus Hœmatodes of the Bladder.

Morbid growths, having the same character, and running the same course with malignant diseases in other textures, are not uncommonly met with in the bladder. Those which I have had the opportunity of examining have belonged to the class of *fungus hœmatodes*. Sometimes a portion of the tumor has resembled scirrhus; but I have never met with one which was wholly of the last-mentioned structure. In one instance I found the tumor situated at the fundus, but the more ordinary situation of it is near the neck of the bladder.

The disease appears to have its origin in the mucous membrane: sometimes occupying the whole of it, so that scarcely any of the natural structure remains at the time of the patient's death, but more

* A very convenient apparatus for this purpose is made by Mr. Sparkes, bandage maker, &c. of No. 28 Conduit Street.

frequently it arises from a limited portion of its surface, while the greater part of the membrane remains in a healthy state. As the disease advances, it forms a large tumor projecting into the cavity of the bladder. In some instances it makes its way in other directions. In a case, in which the tumor was situated at its fundus, the bladder had contracted adhesions to the sigmoid flexure of the colon, and there was a large fungus projecting from it into the cavity of that portion of the intestine. In another case, some time before the patient died, a tumor presented itself in one groin, which rapidly increased to a considerable size. In examining the body after death, there were found scarcely any remains of the natural structure of the bladder. Nearly the whole of it was converted into a mass of fungous or medullary substance, occupying the cavity of the pelvis, and extending laterally so as to show itself in the groin.

In these cases the patient complains of a too frequent inclination to void his urine; of an uneasy sensation referred to the neck of the bladder, which sometimes amounts to severe pain extending to the perineum, and along the urethra to the glans, and in another direction to the pubes. This pain is generally aggravated after the urine is voided. I have known the patient to labor under a retention of urine, in consequence of the tumor pressing on the inner orifice of the urethra, so that it became necessary to puncture the bladder above the pubes. In another case there was a constant wearing pain in the loins, the cause of which was explained by the appearances observed in the *post-mortem* examination: the tumor having obstructed the orifices of the ureters, which were in consequence dilated to the size of the small intestine, the *pelvis* and *infundibula* of the kidney being dilated also, so as to form considerable sacs or pouches, distended with urine.

The urine is usually turbid; sometimes depositing an adhesive mucus, the consequence of long-continued irritation kept by the tumor in the mucous mebrane of the bladder. In the advanced stage of the disease the urine is of a dingy brown color, of an offensive cadaverous odor; and small fragments of medullary substance, which appear to have been separated from the surface of the tumor, may be detected in it. In all cases there is a disposition to hæmorrhage; and in some, bloody urine is a constant, or nearly constant, symptom. The urine is not merely tinged with blood, but the blood comes away in large clots, of an irregular shape, in which small portions of medullary substance are not unfrequently enveloped. The hæmorrhage is occasionally abundant, so that it materially contributes to the gradual exhaustion of the bodily powers, which the disease otherwise induces, and hastens the patient's death.

These symptoms do not always occur in the same order; nor is the rapidity of their progress the same in all cases. I have known the disease to have run its course, so that the patient has fallen a victim to it, in the short space of eight or ten months from the period of its commencement; and I have also known it to be protracted for seven to eight years. Usually, the first symptoms are a too frequent inclination to void the urine, and pain experienced after it has been voided,

but, occasionally, the earliest warning which the patient has of the calamity under which he labors, is the appearance of blood in the urine. I have known the urine to be bloody for a short time, then to become clear, and continue so for one or two years, when the blood has again shown itself, never wholly disappearing afterwards.

In those cases in which fragments of organised medullary substance are to be detected in the urine, there can be no difficulty in the diagnosis; but where this symptom is wanting, each case requires to be observed and studied, in order that it should be understood, as all the other symptoms are equivocal. In the very great majority of cases in which there is blood in the urine, the hæmorrhage is the result of a calculus either in the kidney or bladder; but if there be no calculus, and the quantity of blood be considerable, it is more probable that it is derived from a medullary tumor, than from any other source. If the blood appears in the form of large masses of coagulum, of an irregular shape, we may be satisfied that it flows from the bladder, and not from the kidneys, and we may arrive at the same conclusion, if we find that a small quantity of pure blood is discharged from the urethra after the effort made to expel the last drops of the urine. If under these circumstances the bladder be subjected to two or three careful examinations with the sound, and no calculus can be detected in it, there are strong grounds for suspecting the existence of a medullary tumor. These suspicions will be strengthened if the hæmorrhage be accompanied with a frequent inclination to make water, and a pain extending along the urethra, and to the perineum, after the urine has flowed; and if the tumor be of a large, or even of a moderate size, they may be completely confirmed in another way. Let about six ounces of tepid water be injected into the bladder; a sound, which is considerably curved, but not projecting at the point much beyond the curvature, being introduced into it afterwards. With such a sound as this every part of the bladder may be readily explored; and the extremity will be distinctly perceived striking against the tumor, at the same time that that side of the bladder in which it is situated is found to be of less capacity than the other. In using a silver catheter in this manner, small portions of the substance of the tumor are sometimes found sticking in the eyes, or lateral openings, of the catheter, after it has been withdrawn.

Fungus hæmatodes is not more under our control where it affects the bladder than where it occurs in other organs; and no method which art has hitherto devised affords us the means of even checking the progress of this horrible malady. Rest in the horizontal posture, and opium administered, according to circumstances, either by the mouth or in the form of enema, will do as much as can be done towards mitigating the patient's sufferings. If there be considerable hæmorrhage, and the pulse be full and strong, blood may be taken from the arm, or from the loins by cupping. Otherwise the mineral acids, the acetate of lead, or other styptics, may be given internally. On the whole, it has appeared to me that the mineral acids have done more than any other medicine towards stopping the hæmorrhage.

Other morbid growths occasionally take place in the bladder. I have seen a case in which a fungus grew from a portion of the mucous membrane, having somewhat of a fibrous structure, and a good deal resembling in appearance the vessels of the placenta when unravelled. In Dr. William Hunter's Museum there is a preparation of a bladder, the inner membrane of which is, in several parts, elongated into laminæ or processes, each about a quarter of an inch in length. I cannot undertake to point out to you in what manner such excrescences are to be distinguished from each other in the living body; and as all such cases are equally beyond the reach of remedies, such distinction, even if it could be made, would be of little practical importance.

Symptoms affecting the Bladder in consequence of Disease in the Kidney.

Calculi of the kidney occasionally produce symptoms, which are referred to the bladder rather than to the kidney. I shall have occasion, in a future Lecture, to notice a well-marked example of this fact, which occurred in my own practice; and you will find others referred to by Morgagni. "A patient," says this eminent pathologist, "complained of very little pain in the region of the kidney; while he was tormented with pain in the bladder so excruciating, that five or six physicians who attended him entertained no doubt that the seat of the disease was in that organ. On dissection, however, no morbid appearance whatever was discovered in the bladder, but there were large and ramifying calculi of the kidney."

If calculi of the kidney produce symptoms which may easily be mistaken for those of disease in the bladder, it may reasonably be expected that some other diseases of the kidney should affect the bladder in the same manner. Several years have elapsed since I was first led to suspect this to be the case, and the result of all the experience, which I have since had, has been to remove whatever doubts I might formerly have entertained on the subject. Whoever is much engaged in this branch of surgical practice will meet with a number of facts which cannot so well be explained on any other hypothesis, and which collectively form such a mass of circumstantial evidence, as is almost irresistable, in favor of the opinion "that the worst symptoms of irritable bladder may occur as a consequence of disease of the kidney, the bladder itself, and the organs in immediate connection with it, having been free from disease in the first instance."

The opportunities of obtaining direct or positive evidence, (that is, by means of *post-mortem* examination,) on a point like this, are of comparatively rare occurrence; for so intimate is the union of the different organs which constitute the urinary system with each other, that disease can scarcely exist for a great length of time in one of them, without extending in a greater or less degree to the rest. Such opportunities are, however, occasionally met with where the patient has died before the disease has reached its most advanced stage; and I

am able to adduce the following histories in illustration of the foregoing observations.

A gentleman consulted me in November, 1833, labouring under the following symptoms:—He voided his urine frequently, and in quantities varying from an ounce to an ounce and a half. Always after making water he had a severe pain lasting a few minutes, and extending along the course of the urethra. The urine was pale, semi-opaque, of an acid quality, and, when tested with heat and nitrid acid, it was found to be highly albuminous. Occasionally, small masses of a substance resembling coagulated albumen were seen floating in it. He made no complaint of pain in the loins; he was able to empty his bladder by his own efforts, and the urethra was free from stricture. There was no calculus in the bladder, nor had sand or gravel ever been observed in the urine. These symptoms had begun to exist in the preceding February, since which time they had gradually increased. For a short time during the month of March, the urine had been tinged with blood.

In addition to these local ailments, the general health was much impaired: the patient had lost flesh, was languid, dejected, and of a pallid countenance.

Soon after I was consulted the urine became again tinged with blood. The bodily powers continued to fail, and the local symptoms became more urgent. There was a total loss of inclination for food, the extremities became cold, the pulse feeble, and he died at the end of February, 1834.

On examining the body after death, the kidneys were found to be of a dark color from excessive vascularity, and of a soft and somewhat brittle consistence; the distinction between the cortical and tubular positions being less marked than under ordinary circumstances. The investing membrane of the kidney had a very slight adhesion to the kidney itself, but it adhered very closely to the adipose substance of the loins. On the surface of each kidney, and partly imbedded on its substance, were four or five membranous cysts, each of the size of a large pea; and in one of them there was a similar cist, but as large as a nutmeg, completely imbedded in the cortical substance. The *pelvis infundibula* and ureters were not more capacious than under ordinary circumstances; but, on their being slit open, their internal membranous surface presented the appearances of considerable inflammation.

It could not be said that the bladder was found altogether free from disease, but the morbid appearances were so slight, compared with those observed in the kidney, that it seemed impossible to doubt that the last-mentioned organ had been the seat of the primary disease, and that the latter was affected only in a secondary manner. It was contracted, and the muscular tunic was somewhat thickened; but not more so than must have been the case in a person who from any cause had been teased for a considerable time by an incessant inclination to void his urine. The vessels of the mucous membrane were turgid with blood; but not in the same degree as those of the membranous structures of the kidneys.

A gentleman, fifty-five years of age, consulted me, with Mr. Bagster, of Compton Street, Brunswick Square, in December, 1834, under the following circumstances:—He complained of an almost incessant inclination to void his urine; of an excruciating pain, referred to the region of the pubes and neck of the bladder, which occurred as soon as the urine was expelled, and then subsided ; and also of a most severe pain extending along the whole canal of the urethra. This last symptom was not especially connected with the expulsion of the urine. It was nearly constant, but not quite so, as it occasionally intermitted for twelve hours, or even for a longer period.

The urine was acid, and when voided was slightly turbid, and of an opal color. When allowed to stand, it deposited some loose flakes, which bore a more near resemblance to coagulated lymph than to mucus. The clear urine, after this deposit had taken place, was tested by heat, and afterwards by the addition of nitric acid, and proved to be highly albuminous. There was no pain in the loins.

On inquiring into the patient's history, I was informed that in childhood he had voided a small calculus; that he had generally enjoyed good health until the year 1824, when he was affected by a succession of slight febrile attacks, attended with sickness and vomiting, from which, however, he recovered, so as to be apparently quite well afterwards.

In the year 1827 or 1828, and again in the year 1834, he had a similar attack. The last of these continued, with occasional remissions, from September to the beginning of November ; and immediately after it had subsided the symptoms of irritation in the bladder and urethra first showed themselves, continuing unabated from this period up to that of my being consulted.

After a careful investigation of the case, I gave it as my opinion, that the real seat of the disease was in the kidneys, and that the bladder and urethra were only secondarily affected ; and I proposed a plan of treatment accordingly. This was continued without any manifest improvement until the 5th of January, 1835, when the patient was suddenly seized with a pain in the neighborhood of the *epigastrium*, followed by urgent symptoms of peritoneal inflammation. In this illness he was attended by Dr. James Johnson and Mr. Bagster, but their efforts for his relief were unavailing, and he died in about four days after its commencement.

On examining the body, the abdomen was found to contain a yellow fluid resembling a mixture of bile and serum. Coagulated lymph had been effused on different parts of the surface of the peritonæum, but chiefly in the neighborhood of the *duodenum* and *jejunum*, and had produced adhesions, which, however, being recent, were easily separated. The gall-bladder was attached in this manner to a fold of the *jejunum:* and on these adhesions being torn through, the bile was observed to escape from it in a small stream. On laying open the gall-bladder five or six biliary calculi, from the size of a pea to that of a horse-bean, were found in its cavity; and in one spot there was a distinct ulceration of the membrane lining it. The ulceration had ex-

tended completely through the peritonæum, covering the gall-bladder, so that it was evident that there must have been a communication, between the cavity of that viscus and the general cavity of the abdomen, previous to the formation of the adhesions with the small intestine.

The urethra and the urinary bladder presented no appearance of disease; but the tunics of the bladder were thinner than might have been expected, considering that the patient had for some time suffered from a frequent inclination to make water. The mucous membrane was not more vascular than under ordinary circumstances. The prostate gland was not enlarged; but it might be supposed that its texture was a little firmer than usual.

The right kidney was vascular, and of a somewhat soft and spongy texture; and its investing membrane adhered more closely to the fat of the loins than to the kidney itself. The ureter on this side was unusually small and attenuated. The left kidney was half as large again as usual. The fat of the loins, the investing membrane of the kidney, and the kidney itself, adhered so closely to each other, and were so consolidated that they could scarcely be separated from each other. In the upper part of this kidney there was a membranous cyst, containing about an ounce of a turbid fluid. This cyst appeared at first to have been formed by a dilated *infundibulum;* but on an accurate examination it was found to have no communication with the *pelvis* of the kidney. A good deal of earthy matter had been deposited in the membrane forming it, so that in one part it appeared like a shell of bone. In the lower part of the same kidney were two calculi (composed of the oxalate of lime), one as large as a horse-bean, the other smaller, but of a jagged and irregular figure. They lay in two separate *infundibula*, projecting into the *pelvis*. This kidney, like the other, was soft and vascular. The ureter was in a natural state.

What has been now stated seems to afford sufficient evidence as to the existence of symptoms referred to the bladder and urethra in some cases of disease in the kidney. But, with my present experience, I am led to this further conclusion, that a very large proportion of the cases, which have usually been confounded together, under the general appellation of irritable bladder, are really of this description; and that in many cases, in which the bladder is actually diseased, it was not so in the first instance, the disease in the bladder being altogether a secondary affection, which would never have existed if there had not been a previous disease in the kidneys.

But nothing is more common than to meet with disease in the kidney in the examination of the body after death, where there had been no complaints as to the bladder and urethra during life; and in many living persons there are indubitable signs of the kidneys being diseased, while the functions of the bladder and urethra are not in the slightest degree disturbed. It cannot be supposed that it is merely from a caprice of nature that one organ should sometimes sympathise, and sometimes not, with the diseases of another; and the question there-

fore arises, in what particular cases of renal disease is it that the secondary affections of the bladder are liable to occur?

I have already explained, that where the urine is overloaded with acid, showing itself in the form of lithate of ammonia, or brown or red sand, or where being alkaline it deposits crystals of the triple phosphate of ammonia and magnesia, it acts as a stimulus to the parts with which it comes in contact, and that an irritable state of the bladder is the consequence. But there is no reason to doubt that other unhealthy secretions of urine may produce the same result; and I am much inclined to believe that such is the real explanation of the affection of the bladder in the cases which are now under our consideration. In such of them as have fallen under my observation the urine has been always altered from its healthy condition, and its sensible qualities may be described as follows:—There is usually a copious secretion, the specific gravity being below the ordinary standard. But there is some variety in this respect; and I have known the specific gravity to be as high as 1,030. When tested with litmus paper it is generally found to be slightly acid; but occasionally it is alkaline; or it is sometimes alkaline, and sometimes acid; and, as I shall explain hereafter, the indisposition in it to become alkaline increases as the disease advances. When first voided the secretion is of a pale yellow color, opaque and turbid; sometimes having minute flakes of lymph floating in it. On the addition of nitric acid, or an exposure to heat, there is an abundant coagulation of albumen. When allowed to remain at rest there is a deposit of opaque matter, and not unfrequently of pus. The urine is always albuminous, but quite different in appearance from that which is secreted in the cases which were first described by Dr. Bright, and to which the attention of physicians has been of late years so much directed. The albuminous matter seems to be mechanically suspended, and not intimately blended and assimilated with it; as if the kidney were in a state of chronic inflammation, secreting urine from one set of vessels, and serum, or even pus, from others. Such, probably, is the real nature of the disease when once established, whatever it may have been in its origin; and you will find this view of the case to be confirmed by some facts to which I shall draw your attention presently.

The great majority of the patients who are thus affected are the male sex. Many of them seem to have been originally of a feeble, and what is commonly called a scrofulous, constitution. The disease, however, is by no means confined to persons of this description. It may be the result of calculus long impacted in the kidney. Not unfrequently it follows an attack of gonorrhœa, though I suspect that it may, for the most part, be traced to the treatment employed, rather than to the gonorrhœa itself. I allude to the injudicious exhibition of large doses of copaivi and cubebs, especially of the latter.

The patient complains of a too frequent inclination to void his urine; the period during which he can retain it varying from a quarter of an hour to an hour. There is a cutting pain referred to the neck of the bladder and urethra as the urine flows, and remaining for some time

afterwards: there is a constant sense of uneasiness above the pubes. Sometimes there is a dull, but rarely a severe, pain in one or both loins; at other times there is no pain in the loins whatever, or so little, that the patient scarcely thinks of mentioning it until he is questioned on the subject. In a few instances, masses of lymph, of the consistence and appearance of jelly, are found in the urine, which have evidently descended from the kidney. In one case the patient, who for two or three years had had no other symptoms than a too frequent desire to make water, and a deposit of pus in the urine, was suddenly seized with a most severe pain in the groin and testicle, so that I concluded that a renal calculus was making its way down the ureter. Instead of this, however, soon after the pain had suddenly terminated, there was found in the urine a mass of solid substance, resembling fibrine, of a pale-brown color, of a conical shape, smooth every where, except at the larger extremity, where it had an irregular and fringed appearance, as if it had been broken off from a larger mass. From this time he continued to suffer in the same manner, voiding similar masses of solid substance at various intervals, and in one of these attacks he died. His death took place in the country; and I believe that no examination of the body was made afterwards. From the account which I received, however, I was led to conclude that the immediate cause of death had been the retention of one of these masses of fibrine in the ureter.

As the disease advances the patient becomes feeble and emaciated; his complexion is sallow, and he is liable to attacks of nausea and even of vomiting, with a constant sense of languor and listlessness, and indisposition to both mental and bodily exertion. The desire to void the urine is incessant, and the sufferings caused by the accumulation of it in the bladder are more severe. As the bodily health becomes impaired, the disposition to secrete alkaline urine is increased; and this change is the usual precursor of the more urgent symptoms of affection of the bladder which mark the advanced stage of the disease. The urine deposits a large quantity of adhesive alkaline mucus: it is of an offensive ammoniacal odor, scalding the urethra as it flows, and producing a severe and constant pain in the hypogastrium. Even in the origin of the disease blood is sometimes discharged with the urine; but at this later period the disposition to hæmorrhage is increased. In some cases the urine generally is tinged with blood, and at other times there is an evacuation of pure blood, adding greatly to the patient's misery, not only in consequence of the clots becoming lodged in the urethra, and obstructing the passage of the urine, but by increasing the debility of an already weakened frame. The pulse becomes small and frequent, the tongue is dry and brown, or red and glossy, with a disposition to aphthæ; there is coldness of the extremities; and these symptoms usually precede the patient's dissolution. But it is otherwise in some instances, the patient dying almost suddenly even in a less advanced stage of his complaint. It would appear that not only in these, but in many other cases of disease of the kidney, the powers of the constitution become so impaired, that an accidental circumstance, which, if the patient were in health, would be productive of no more

than a temporary derangement of his system, may be sufficient to extinguish life. I have even known a case in which the introduction of a bougie having been followed by a severe rigor, the usual re-action never took place, and the patient died in consequence.

I have had several opportunities of examining the morbid appearances after death, where the patient had died in this last stage of the disease, and where the history of the case seemed clearly to prove that the kidney had been the only part affected in the first instance. One or both kidneys are found enlarged in size; unusually vascular; of a dark red color: soft and readily torn; the distinction between the cortical and tubular portions being less distinct than under ordinary circumstances. Interspersed throughout this diseased mass there are sometimes small deposits of a yellow substance, apparently unorganized lymph. The membranous capsule adheres more closely to the surrounding parts than to the kidney itself. Sometimes the kidney and ureter are imbedded in a mass of firm organized lymph, which involves all the neighboring structures. Frequently there are thin membranous bags of various sizes in the cortical substance containing, not urine, but a serous fluid. Abscesses are found in the kidney of various sizes, some of which may have made their way into the *pelvis* and *infundibula*. In one case one kidney was of double its natural size; and full of deposits of cheesy matter, resembling that which is found in scrofulous lymphatic glands, varying in quantity from the bulk of a pea to that of a horse-bean. The other was diseased in the same manner, but to a less extent. Sometimes an offensive mixture of pus and urine is found in the pelvis and ureter. Occasionally, but rarely, there are deposits of phosphate of lime adhering to the mamillary processes; more frequently there are similar deposits on the inner surface of the membranous cysts and abscesses. The mucous membrane of the bladder and ureters, in most instances, is every where of a dark-red color, from excessive vascularity, and exhibits the other appearances which have been already described in the history of inflammation of the mucous membrane. In a few cases, however, the appearance of inflammation is only in patches, and where it exists the mucous membrane is ulcerated. These ulcers occur more especially about the orifice of the ureter, the outer extremity of which is seen making a small nipple-like projection in the centre. If the patient survives this stage of the disease, the ulceration of the mucous membrane extends until it occupies a large portion of the internal surface of the bladder. Nor are these secondary diseases confined to the bladder. I have seen cases in which abscesses and ulcers of the prostate gland were apparently to be referred to the same source. I shall call your attention to this last-mentioned subject again in the next Lecture.

Treatment of these Cases.

You will easily believe that, in the advanced stage of the complicated disease which I have just described, little is to be done by art for

the patient's relief. The exhibition of the decoction of the root of *pareira brava*, with mineral or vegetable acids, may render the urine less alkaline, and somewhat restrain the secretion of the adhesive mucus from the inflamed mucous membrane. Large doses of opium may, in some degree, mitigate the patient's sufferings, and the prudent exhibition of wine may for a time uphold his failing powers. But this is all; and the disease will pursue its course to a fatal termination in defiance of all your efforts to arrest its progress. Even when you are consulted at an earlier period, you will find, in many cases, that the best exertions of your skill end in disappointment. It seems as if when the kidney has been for a considerable time the seat of disease, even though no actual organic change of structure has taken place in it, it were almost incapable of recovery, and, at all events, if one drop of matter be deposited in its substance, this must be regarded as the rudiment of a large abscess, and as leading, almost inevitably, to the worst ultimate result.

There are, however, cases in which much may be accomplished under a judicious treatment; and I have notes of several in which patients who had been great sufferers for one or two, or even a greater number of years, were apparently restored to health. The remedies which I have found useful have been few in number, and the history of them may be comprised in a few words.

If the urine be more than usually loaded with lithic acid, some advantage may be derived from the exhibition of moderate doses of the *liquor potassæ*, or the bicarbonate of potass. But this is seldom necessary, and alkalies ought to be administered with great caution where there is danger of the urine becoming alkaline, and where this change in the quality of the secretion is likely to be followed by such serious consequences as those which I have described. Whenever the urine is already alkaline, or has a tendency to be alkaline, of course the opposite treatment is indicated, and the mineral acids should be given in larger or smaller doses according to circumstances.

In robust persons, where the disease is but little advanced, and there is much pain in the loins, a moderate quantity of blood may be taken from the loins by cupping. But there can be no greater practical error than to suppose that because a disease partakes of the inflammatory character, it is therefore to be relieved by blood-letting. Many such diseases are liable to occur in persons of debilitated constitution, and have a tendency to increase the debility in which they have originated, being at the same time aggravated instead of being relieved, not only by the loss of blood, but by active depletion in other ways. In some instances I have known much good to arise, apparently, from blisters applied near the affected loin, or from issues made with caustic, or setons in the same situation. But even these should not be had recourse to without due consideration; and in persons of a delicate habit I am inclined to restrict their use to those cases in which the pain in the loins is considerable, or in which there is a discharge of pus, or of masses of unorganized lymph from the kidney.

For the same reason that depleting remedies are to be used with

caution, it is never desirable that the patient should be placed on a very low or abstemious system of diet. He should have animal food daily, with the addition of a moderate quantity of ale or wine. He should, if possible, reside on a dry gravelly soil rather than in a low and damp situation; or he may derive benefit from a residence at the sea-side.

The *uva ursi* has a doubtful reputation as a remedy in cases of disease of the bladder, some believing it to be of great efficacy, and others attributing to it no efficacy whatever. My own experience would lead me to suspect that its influence is confined to the cases of which I am now treating, but that in these it may in some instances be employed with much advantage. It must be administered, however, in larger doses than those which I find to be in common use. Thus from ʒ j. to ʒ ij. of the extract may be given in pills daily, or from ʒ viii. to ʒ xvi. of the following infusion, which has appeared to me to be more efficient than the extract.

℞ *Foliorum uvæ ursi* ʒ j.
Aquæ distillatæ fervientis ʒ xviij.
Macera per horas ij, *dein decoque ad* ʒ xvj. *et cola.*

But neither the extract nor the infusion produce an immediate improvement; and if the experiment of taking this medicine be begun the patient must make up his mind to persevere in it for a very considerable time, before he can form an opinion as to the result.

There is, however, another remedy, which, if my observations be correct, is much more to be relied on than the *uva ursi*, namely, the *diosma crenata*, or buchu. Of this, also, I am led to believe that its efficacy as a medicine is limited to this particular class of cases, and in these I cannot doubt that I have seen it productive of the most beneficial effects. From ʒ iss. to ʒ ij. of the infusion of the diosma (of the Pharmacopœia) may be given twice or three times daily. The operation of it is slow, like that of the *uva ursi*. Many weeks must elapse before there is any sensible amendment, so that it is needless for the patient to take it unless he fully intends to continue to do so for a very long period. I have known persons who, with some brief occasional intermissions, have persevered in its use, slowly but uniformly mending, even for two or three years. Where there is a superabundance of lithic acid in the urine, small doses of the bicarbonate of potass, or *liquor potassæ*, may be added to the infusion; and where the urine is alkaline, or has a tendency to be so, it may be given in combination with the mineral acids.

Another remedy, which I have administered with great apparent advantage in these cases, is the *tinctura ferri muriatis*. It may be given in doses of ♏ viij. to ♏ xv. twice daily, either in any simple vehicle, or in combination with the infusion of the diosma. In the latter case, the tincture may be given for a month or six weeks at a time; and this course may be repeated occasionally, the infusion being still administered in the intervals.

Before I conclude the present Lecture, I feel it to be my duty to

caution you against the unnecessary introduction of instruments into the bladder in these cases. It may be right, probably it is so in most cases, in the first instance, to introduce a sound or catheter, so as to ascertain whether there be an obstruction in the urethra, or a calculus in the bladder, or whether the patient retains the power of emptying the bladder by his own efforts. But if these questions be determined in the negative, it is better that you should abstain from the further use of instruments. Every examination gives the patient a good deal of pain at the time, and it often happens that much distress: both local and constitutional, follows, which may not subside for two or three days. Rigors also are more likely to occur after such examinations, than in ordinary cases of urinary disease; and I have already observed, that these are attended with actual danger in all cases in which the powers of the system are exhausted by long continued disease of the kidney. Where it is thought advisable to examine the urethra and bladder by the introduction of instruments, twenty or thirty minims of tincture of opium may be administered immediately afterwards. This will rarely fail to prevent the occurrence of a rigor, and no inconvenience, which the laudanum may occasion, can be put in competition with the great advantage arising from its use.

LECTURE VII.

Inflammation of the Prostate Gland.

Affections of the prostate gland are met with chiefly in those who are advanced in years. This organ, however, is not altogether exempt from disease in earlier life. In cases of gonorrhœa it not unfrequently happens that the discharge from the urethra suddenly ceases, and that the inflammation, leaving the part originally affected, attacks the prostate. The peculiar symptoms which occur in the cases to which I allude cannot well be explained in any other way, and it may be observed that they never occur except in the male sex.

The patient observes that the gonorrhœal discharge stains his linen much less than it did before, or that it ceases altogether; and he experiences at the same time a frequent inclination to void his urine, and a difficulty in voiding it. He complains of uneasiness and pain, referred to the neck of the bladder, and extending forward in the course of the perineum and urethra, and aggravated on each attempt to make water. In some cases there is a complete retention of urine. The impulse to make water is then violent and irresistable; and it is attended with more suffering than in ordinary cases of retention, on account of the contents of the bladder being pressed with force against the inflamed and tender prostate. There is a sense of fulness in the pe-

rineum and rectum ; and the prostate is manifestly tender when examined from the rectum with the finger.

Not uncommonly suppuration takes place, and an abscess forms, of which the symptoms, in the first instance, are generally obscure. As the abscess advances, the perineum becomes tender, and there is a perceptible though slight tumefaction and hardness in some one part of it. The abscess, if left to takes its own course, sometimes bursts internally—that is, into the urethra; more frequently it makes it way through the fascia, cellular membrane, and muscles of the perineum, and bursts through the external skin.

These local changes are attended with no small degree of disturbance of the general system. The pulse is frequent, the skin hot, the tongue furred, and the formation of matter is often indicated by rigors.

The first object of the surgeon should be to prevent suppuration. The patient should remain in bed, in the horizontal posture. Blood is to be taken from the loins, or perineum, by cupping; and the cupping should be repeated, or not, according to circumstances. Cupping on the perineum, however, can be performed only by a dexterous cupper; and where such an one cannot be procured, leeches must be applied instead. An active aperient should be exhibited, followed by an opiate in the form of an enema or suppository; and the patient will often derive the greatest benefit from the use of calomel taken in pills in sufficient quantity to subject him to the mercurial influence. If there be a retention of urine, the gum catheter, without a wire or stilet, may, in almost every case, be readily passed into the bladder. It is better to use a very small catheter, and to introduce it again, whenever it is necessary to do so, than to leave it constantly in the urethra and bladder. If there be reason to believe that abscess is formed, you should endeavor to procure an external discharge for the matter, in order to prevent it bursting into the urethra. If such symptoms as I have described exist, and go on for some time increasing, and you discover a fulness and tenderness of the perineum, do not wait for any more certain indication of the abscess; but introduce a lancet, in the direction indicated by the tenderness and swelling. It will often be necessary to pass it quite up to the shoulders, or even to the handle, before you reach the abscess. But you may do this fearlessly. There is no danger of any ill consequences from such a puncture. If there be abscess, you will by this proceeding immediately relieve the distress which the patient suffers, at the same time that you prevent further mischief. If, on the other hand, there be no abscess, the puncture does not make the condition of the patient worse than it was before. Indeed, partly from the loss of blood, partly by removing the tension of the soft parts of the perineum, it is generally useful to the patient, even when it does not answer the purpose of allowing the escape of matter.

But abscess of the prostate gland may take place in young men under other circumstances, besides those which I have just mentioned.

A man about thirty years of age was received into the hospital, voiding his urine every twenty or thirty minutes, and complaining of

an aching pain in the loins; but of no pain anywhere else. The urine deposited a small quantity of yellow puriform sediment. He said that the symptoms had begun two years ago, and that in the commencement of the disease the urine had been tinged with blood. I prescribed the use of an opiate clyster every night; and under this treatment the inclination to make water became less frequent.

About a month after his admission into the hospital, the patient was suddenly seized with symptoms of apoplexy, and he died in the course of a few hours. In the examination of the body, we discovered an abscess of the size of a large walnut, occupying the posterior part of the prostate gland, and extending into the space between the bladder and *vasa deferentia* behind the neck of the bladder. On slitting open that portion of the urethra which passes through the prostate, a large irregular ulcerated orifice was discovered behind the *verumontanum*, through which the probe passed at once into the cavity of the abscess.

I had the opportunity of observing the same morbid appearances in the *post-mortem* examination of a patient who died under the care of Dr. Prout and myself, and who had long labored under symptoms of disease at the neck of the bladder. I conclude that in the following case, also, the seat of the abscess was in the prostate gland.

A gentleman, about thirty years of age, consulted me, complaining that the urine flowed slowly, and with difficulty. I introduced a gum catheter, and found a considerable quantity of urine left in the bladder, after he had voided what he could by his own efforts. There was no stricture of the urethra, and the use of the instrument did not relieve the difficulty of making water, so that it was necessary to introduce it two or three times daily. When this plan had been persevered in for three or four days, there took place one evening a severe attack of shivering. The next day it was discovered that the urine deposited a considerable quantity of pus. The patient could now make water and empty his bladder without the assistance of the catheter: however, he was directed not to do so, but to use the catheter for himself every six or eight hours. The urine continued to deposit the same purulent sediment, but the quantity of it gradually diminished, and in the course of two or three weeks it disappeared entirely; and no symptoms being left, the further use of the catheter was not considered necessary. I have seen this gentleman several times since, on other occasions, and, as far as I know, he has never had any return of the complaint.

In the case which I have mentioned as having been attended by Dr. Prout and myself, in addition to the abscess at the neck of the bladder, there were abscesses and extensive disorganization of the kidneys. I may here refer you to what I observed as to the co-existence of disease in the kidney and bladder in the last Lecture. We cannot well doubt the existence of this combination in the following case, although the fact was not absolutely proved by dissection.

A young man had symptoms which led me to suspect the existence of abscess of the prostate. Under these circumstances, he was seized with a rigor, with pain in the loins, extending downwards in the

course of the ureter; in short, with symptoms like those produced by the passage of a calculus from the kidney into the bladder. These symptoms suddenly ceased, and he voided not a calculus, but a mass of lymph and pus, and some blood, which came away with the urine. I now was led to believe that I had been mistaken in my notion as to the original seat of the disease, and to suspect that the neck of the bladder had been affected only from sympathy with the kidneys; but soon afterwards another abscess presented itself in the perineum, which I opened with a lancet, proving that my original opinion had not been incorrect. This gentleman went into the country, and soon afterwards died laboring under a severe diarrhœa. Unfortunately, the body was not examined after death.

When a patient labours under such symptoms as would lead you to believe that an abscess has formed in the prostate, communicating with the neck of the bladder, you should direct him not only to be as quiet as possible, but to remain altogether in the horizontal posture. You should instruct him in the use of the gum catheter; and he should introduce it for himself whenever he has the desire to void his urine, so that he may always make water by means of the catheter, and not by his own efforts. In some instances I have caused the gum catheter to be constantly retained in the urethra and bladder, until the abscess has healed: but this plan not unfrequently irritates the neck of the bladder; and the occasional introduction of the catheter is, for the most part to be preferred. In some instances, even this excites irritation, and the catheter must be omitted altogether.

Besides this, you must attend to the state of the patient's general health. There is usually in these cases a weak state of the constitution; the patient is probably of a scrofulous habit; and the healing of the abscess may be promoted by the exhibition of the sulphate of quinine, or steel, or other tonics. I have been led to believe, in some cases, that good has been derived from the internal use of the cubebs pepper, twenty grains of which may be administered three times daily. It seems to act as a gentle stimulus to these parts, probably operating on the disease much in the same way as Ward's paste operates on abscesses and fistulæ, and ulcers of the rectum.

I have mentioned formerly that an enlargement of the prostate gland sometimes occurs as a consequence of stricture of the urethra, subsiding spontaneously after the stricture is cured. The same thing may happen after gonorrhœa, especially where the patient has neglected his complaint; hunting and using other violent exercise before the discharge has ceased. In one case of this kind the prostate was enlarged (apparently) to four or five times its natural size, producing much uneasiness from pressure on the rectum, but not in any degree interfering with the functions of the bladder. The disease subsided; but very

gradually; and in the course of three or four years no perceptible enlargement remained.

I shall mention the particulars of another case, in which the patient attributed the disease to an attack of gonorrhœa at a former period, and which is also of some interest on account of its having immediately yielded to the treatment employed.

A gentleman, thirty-one years of age, consulted me, with Mr. Turner, King Street, Holborn, under the following circumstances. He complained of pain, referred to the perineum, hypogastrium, and back part of the pelvis, extending down the thighs. The pains, however, were not very severe. He had a sense of obstruction in the rectum on the passage of the fæces. He was tormented by the desire to void his urine more frequently than is usual; but he had no difficulty in voiding it: he could empty his bladder by his own efforts, and the urine was transparent and healthy. The urethra was free from disease; but the prostate gland, when examined from the rectum, was found to be enlarged to two or three times its ordinary size. The patient said the disease had existed in its present form for three or four years; but that he could nevertheless trace its origin to a severe gonorrhœa under which he had labored ten years ago. He had no other complaints. We prescribed for him two grains of the iodide of potassium to be taken three times daily. This plan was pursued under Mr. Turner's direction for about seven weeks, when I was again consulted. He was now nearly free from pain; voided his urine not more frequently than other persons, and as much as ʒ x. at once. The prostate gland was reduced to its natural size. As a matter of precaution I advised that the iodide of potassium should be taken for another fortnight.

Chronic Enlargement of the Prostate Gland.

I have said that the prostate gland is more frequently the seat of disease in old age than it is in youth.

At different periods of human life different changes take place in the condition of the organs of which the system is composed; and none of these are more remarkable than those which show that the individual has entered on that downward course, which is to end in his dissolution.

When the hair becomes grey and scanty, when specks of earthy matter begin to be deposited in the tunics of the arteries, and when a white zone is formed at the margin of the corner, at this same period the prostate gland usually, I might perhaps say invariably, becomes increased in size. This change in the condition of the prostate takes place slowly, and at first imperceptibly, and the term *chronic* enlargement is not improperly employed to distinguish it from the inflammatory attacks to which the prostate is liable in earlier life.

In the *post-mortem* examination of persons, who die laboring under this disease, we find the prostate sometimes enlarged only in a slight degree; but frequently it is two or three times, and occasionally even

ten or fifteen times, its natural size. We also find more or less alteration in its texture. For the most part it is harder than natural; but, in a few instances, it is the reverse. In some instances, the enlarged prostate retains nearly its natural form; and, under these circumstances, if you lay open the cavity of the bladder, you find the existence of the disease marked only by the appearance of an uniform circular projection surrounding the internal orifice of the urethra. More frequently, however, the form of the prostate is altered, and it no longer presents the appearance of a chestnut placed at the neck of the bladder, and perforated by the urethra. Posteriorly the lateral portions of the prostate are found extending on the outside of the *vesiculæ seminales*, between the bladder and the rectum. That part of the prostate, also, which is situated between the *vasa deferentia* and the neck of the bladder, and to which Sir Everard Home has given the name of the third lobe, becomes enlarged also, forming a tumor projecting forward into the cavity of the bladder, behind the inner orifice of the urethra. This tumor varies in size from that of a horse-bean to that of an orange. When small, it is of a conical form, with the apex of the cone projecting into the bladder, and the basis being continued into the rest of the prostate. When large, the basis is often the narrowest part, and it swells out so as to have a puriform figure towards the bladder. In some instances, by the side of that which I have just mentioned, there is another tumor, formed by one of the lateral portions, also projecting into the bladder.

The canal of the urethra, where it passes through the enlarged prostate, is generally flattened; and when the latter is divided transversely, the urethra appears like a slit, rather than like a cylindrical canal. Not unfrequently the enlargement of the prostate so alters the form of the urethra, that instead of pursuing a straight course through the gland, it is inclined first to one side and then to the other. You would expect the urethra to be rendered narrow in consequence of the increased bulk of the parts by which it is surrounded; and so it is in many instances: in others, however, it is actually wider, being dilated into a kind of sinus, where it lies in the centre of the prostate. I have known such a sinus to exist, of a sufficient size to contain two or three ounces of fluid. In addition to these changes, the natural curve of the urethra, as it approaches the bladder, is increased. It forms a portion of a smaller circle. It also becomes elongated, so that the distance between the orifice on the glans penis and the cavity of the bladder is greater than natural. This is the necessary consequence of the incseased size of the prostate; and in this manner as much as an inch or an inch and a half is sometimes added to the length of the urethra.

Malignant diseases of the prostate are of a very rare occurrence, and it is certainly a great mistake to apply the term scirrhus to the cases which are now under our consideration. The chronic enlargement of the prostate may be said to be a disease of a peculiar kind, having no exact resemblance to what we meet with in any other organ. It may, however, in some respects, be compared to the chronic en-

largement of the thyroid gland, known by the name of bronchocele. Like the latter, it is generally slow in its progress; and frequently, after having reached a certain point, if proper treatment be employed, it remains almost stationary for many years. It is on the whole a rare occurrence for it to terminate in ulceration or abscess; and the symptoms, to which it gives rise, are, with a few exceptions, to be referred to the influence which the disease exercises over the functions of the parts in the neighborhood.

Symptoms of the Chronic Englargement of the Prostate Gland.

There are but few individuals who, in the later period of life, do not suffer some degree of inconvenience in consequence of the enlarged state of the prostate. The bladder becomes irritable, and there is a more frequent inclination to void the urine than under ordinary circumstances: at the same time the urine is ejected in a slower stream. These symptoms come on very gradually, and for a considerable time attract but little of the patient's attention. A sudden and violent aggravation of them may, however, take place at any period. In consequence of exposure to damp and cold, or some irregularity as to diet, and, very frequently, as a result of venereal excitement at a time when the sexual powers are beginning to decline, there is an increased determination of blood to the prostate, which was before enlarged, causing it to become still further increased in size. The expulsion of the urine then becomes more difficult than it was before, and soon is prevented altogether. There is, in short, a complete retention of urine.

The symptoms of retention of urine, from enlargement of the prostate, are not very different from those which occur where the retention is the consequence of stricture, but the termination is different. I never saw a case in which, under these circumstances, the bladder had given way, as sometimes happens where there is a retention from stricture; but I am informed that such a case has occurred, and that the bladder, ruptured at its fundus, is preserved in the Museum of St. Bartholomew's Hospital. It is evident that the urethra itself cannot be ruptured, as the urine does not even enter it, the obstruction being altogether posterior to it. But the patient cannot survive a retention of urine from this cause, any more than he can survive a retention of urine from other causes, beyond a certain period of time. The powers of his nervous system become exhausted: there is a cessation of local suffering; the tongue becomes dry and black, coma supervenes, and the symptoms terminate in death. Mr. Travers has informed me of a few cases of long-continued retention in consequence of enlargement of the prostate, which fell under his observation, in each of which the mucous membrane was converted into a slough, and was found, after death, lying loose in the cavity of the bladder.

The prostate being once enlarged, it is evident that a very small addition to its bulk may be sufficient, under certain circumstances, to

prevent the expulsion of urine from the bladder. Hence it is, that no individual who labors under this disease can be regarded as being at any time free from the danger of a complete retention of urine. This, however, where surgical assistance can be procured, and proper treatment is employed, is for the most part only a passing evil. The patient is relieved by the judicious administration of art, and a considerable time may elapse before he experiences another similar attack.

But he is liable to other evils, which, although less formidable in appearance, and more insidious and gradual in their progress, lead, if neglected, to a no less fatal result. As the disease advances, the urine is ejected in so slow a stream that it drops perpendicularly downwards from the orifice of the urethra. It is voided at short intervals —every hour, or half hour, or every twenty minutes; or, perhaps, it dribbles away involuntarily. This latter symptom occurs especially when the patient is in bed, and is a source of great anxiety and distress. At the same time, a slight degree of pain is experienced in the course of the urethra, and in the glans penis. At first the urine is clear, in no way different from that of a healthy person; then a few small threads of flocculi are seen floating in it; and afterwards it becomes slightly turbid and opaque. If, under these circumstances, you introduce the catheter into the bladder, you find a simple explanation of all these symptoms. Although the patient is continually voiding his urine, and gets rid of the usual quantity in the twenty-four hours, his bladder is never empty. A certain portion of urine is always stagnant in it, the quantity of the residuum varying, in different cases, from one or two ounces, to one or two pints, or even more.

Now, I do not mean to assert, that all persons, in whom the prostate is enlarged, lose the power of emptying the bladder, but I certainly believe that this happens in the greater number of instances; and you will soon learn how important is the knowledge of this fact, whether it be viewed in connection with pathological science or practical surgery.

When the prostate gland is much enlarged, the tumor, projecting into the bladder, irritates the mucous membrane, which becomes in consequence affected with chronic inflammation. The same effect is produced, and to a still greater extent, by the constantly distended state of the bladder. The inflamed surface secretes a thick, tenacious mucus, having an offensive ammoniacal odor, which is in itself a source of irritation, aggravating the inflammation in which it had its origin. I have already explained to you what are the symptoms and the consequences of chronic inflammation of the mucous membrane of the bladder, and you will easily understand how much this complication must add to the patients sufferings and danger. Chronic inflammation of the mucous membrane of the bladder is, indeed, one of the most frequent causes of death in neglected cases of enlargement of the prostate; and where it does not operate directly, it frequently operates indirectly, so as to produce a fatal result. Small earthy deposits are formed in the alkaline mucus; many of which, instead of

being expelled by the urethra, fall to the bottom of the residuary urine: these, increasing in size, and ultimately becoming cemented together, lay the certain foundation of a calculus in the bladder. I shall give you a more particular history of vesical calculi, produced under these particular circumstances, in a future Lecture.

In all cases of enlarged prostate, in which the disease is allowed to take its own course, the muscular tunic of the bladder becomes increased in thickness and strength. The reason of this is obvious. The bladder has been called on to make unusual efforts; and all muscles, under these circumstances, acquire an increase of size. The mucous membrane frequently becomes protruded through the triangular spaces between the muscular fibres, forming pouches, or cysts, similar to those which I have already mentioned as occurring in neglected cases of stricture of the urethra. These cysts are generally small, but occasionally they attain a large size; and it is remarkable that they sometimes contain what appears to be pure pus, while the bladder, with which they communicate, contains only urine. An old gentleman consulted me, labouring under disease of the prostate gland. He had a frequent inclination to void his urine; and on introducing the catheter, immediately after he had voided it, about three or four ounces of urine were found to have been left in the bladder. But what he chiefly complained of was an uneasy sensation in the rectum. He gave it the name of a *worming* sensation, and said it was as if a worm were crawling between the bowel and the bladder. One day, after drawing off the usual quantity of nearly clear urine, on introducing the catheter a little further, to my surprise, half a pint of pus came away. The same thing occurred two or three times afterwards. At first I was led to believe that the catheter had entered the cavity of a common abscess. But it was not long before I had the opportunity of ascertaining the real nature of the case. The patient died; and on examining the body, the prostate gland was found a good deal enlarged; there were three cysts, of various sizes, communicating with the bladder, and formed in the manner which I have just described. The largest of these were situated between the bladder and the rectum, and contained half a pint of pus. There was no ulcerated surface: and the pus was evidently secreted by the mucous membrane of which the cyst was composed.

It is not uncommon, on making a section of an enlarged prostate gland, to find in its substance several small collections of a muco-purulent fluid, having the appearance of pus mixed with the natural secretion of the gland. Sometimes there is a distinct abscess, which attains a very considerable size, presenting itself, at last, in one or another situation, according to circumstances. A gentleman who had labored under enlargement of the prostate for many years complained of uneasy sensations about the hips, extending down the thighs. At the same time his pulse was somewhat accelerated, and he was subject to attacks of chilliness, not amounting to rigors. He was in the habit of introducing the catheter; and he observed that it entered the neck of the bladder with some degree of difficulty, as if

the urethra, where it passes through the prostate, was contracted in the diameter. These symptoms had existed for many months, when at last, while he was in the act of using the catheter, an abscess burst, and several ounces of pure pus were discharged by the urethra. I had another patient who complained of similar sensations, and also of an increased difficulty in introducing the catheter, so that I was led to believe that an abscess had formed in the prostate. When he had continued in this state for many weeks, an abscess burst into the rectum, discharging a considerable quantity of pus, and this was followed by the relief of all the symptoms. In a third case, the patient, not content with leading the quiet life which I had recommended, returned to his favorite pursuit of hunting. The formation of an abscess in the prostate was the consequence. When I was again consulted, the abscess had presented itself in the perineum. I opened it with a lancet, and some ounces of pus escaped. However, the whole of its contents were not freely discharged through the artificial opening, and the abscess afterwards burst into the urethra. For a long time matter continued to flow in large quantity by the orifice in the perineum, and by the urethra also. At last the quantity of discharge underwent a sensible but gradual diminution. It had not, however, entirely subsided when I last saw the patient, which was more than two years from the period of the abscess having been opened.

I have said that it is not uncommon to find on dissection that suppuration had begun to take place in the substance of the prostate, probably in its excreting ducts ; and I conclude that such is the origin of the abscess in the greater number of cases in which an abscess is formed. It is, however, not improbable that in some instances suppuration may take place in the cellular membrane to an enlarged prostate, as an abscess connected with a diseased lymphatic gland is often situated, not in the substance of the gland, but on its surface, in the cellular membrane between it and the skin.

Ulceration of the surface of that portion of the prostate which projects into the bladder occurs occasionally in the very advanced stage of the disease. An elderly gentleman, who labored under disease of the prostate gland, and was in consequence unable to empty his bladder by his own efforts, was in the habit of relieving himself by the introduction of the catheter twice or three times daily. He had gone on in this way for a year and a half, when he began to experience great uneasiness as soon as a very few ounces of urine were collected in the bladder, and was, in consequence, under the necessity of introducing the catheter four or five times in the twenty-four hours ; at the same time that the urine became dark-colored, as if from a small admixture of blood. These symptoms gradually increased, until at last the accumulation of even two or three ounces of urine produced violent spasms of the bladder and abdominable muscles, attended with such agonizing pain that he could not forbear screaming. The introduction of the catheter relieved him for a time ; but in the course of one or two hours the pain and spasms returned as severe as before, and continued until the catheter was again had recourse to. He remain-

ed in this state nearly three weeks, and at the end of that period died, as if exhausted by excessive suffering. On examining the body after death, the prostate gland was found much enlarged. The posterior middle portion of the prostate projected into the bladder, forming a tumor as large as a walnut, and one of the lateral portions projected in the same manner of a still larger size. The surface of each of these tumors was in a state of ulceration. The mucous membrane of the bladder was almost of a black color, in consequence of its vessels being very much loaded with blood. In another patient, in whom symptoms of the same kind, but less in degree, had existed for more than a year before the disease terminated in death, the postate was found to be ten or twelve times its natural size, making a large circular projection into the bladder, round the internal orifice of the urethra. Nearly the whole of this portion was superficially ulcerated, and in some places the ulcerated surface was incrusted with a thin layer of coagulated lymph.

A prostate gland which is extensively ulcerated is liable to bleed ; but this may be the case also with a prostate which is not ulcerated, or which is ulcerated only to a small extent. Hæmorrhage may, in fact take place from an enlarged prostate as from any other tumor. Generally, the hæmorrhage is small in quantity ; but sometimes it is abundant and alarming. A gentleman labored under disease of the prostate. He was in the habit of introducing the gum catheter himself. One evening he observed that blood flowed with the urine. In the course of the night he called me up, and I found him with the bladder enormously distended, prominent in the abdomen as high as the navel, and blood still flowing from the urethra. I introduced a large catheter, but no urine escaped. The bladder was distended, not with urine, but with blood. I directed the patient to lose blood by cupping in the loins, and to remain quiet ; and, under this treatment, the hæmorrhage ceased ; not, however, until a very large quantity of blood had been lost. The catheter was afterwards introduced three or four times daily. The blood by degrees became dissolved in the urine, and, after two or three weeks, the latter was as clear as it had been before the attack of hæmorrhage took place. But the pulse was frequent, the skin hot, the tongue dry and brown, and the patient survived the hæmorrhage only a month. In the *post-mortem* examination, I found the mucous membrane of the bladder extensively inflamed; a large tumor of the prostate projected into the bladder; and it appeared to me that I could discern the exact spot in which the vessels of the tumor had given way, and from which the hæmorrhage had proceeded. I have seen many other cases of hæmorrhage from the prostate. I had one patient, in particular, who had two attacks of hæmorrhage even to a greater extent than in the case which I have just related, from both of which, however, he recovered, under the treatment which I shall describe hereafter.

I have already explained in what manner the bladder suffers in consequence of enlargement of the prostate gland. The kidneys suffer also, and it is this which principally baffles our skill, and renders vain

all our efforts for the patient's relief, in neglected cases of this description.

In a former Lecture I have stated, that disease of the kidney is a frequent consequence of a neglected stricture of the urethra. The renal affections which arise from this cause are very similar to those which arise from disease of the prostate. The same description will apply to both orders of cases; and it is for this reason that I only briefly alluded to the subject as connected with disease of the urethra, referring you to the present Lecture for further information on it.

These secondary renal affections are various.

1. In many cases the secretion of urine is considerably augmented. There is a very large flow of urine of a pale straw color, and this may take place without any considerable alteration in the structure of the kidneys that we can discover on dissection. In one instance, in which the urine had been such as I have described for some years before the patient died, both kidneys were found of a pale color, and the glandular structure of them was much diminished in bulk, the pelvis being at the same time considerably dilated. In other respects, the appearance of these organs was the same as under ordinary circumstances.

2. There are other cases, in which the secretion of urine is much diminished in quantity or wholly suppressed. My attention was first called to this fact by the following case, which came under my observation many years ago. A man, who was not much past the middle period of life, but who was old in constitution, had symptoms of enlargement of the prostate gland for two years or more before I saw him. At this time he was harassed by an incessant desire to void his urine. But the quantity which he voided at one time was very small, so that the whole amount of what was discharged in twenty-four hours did not exceed half a pint. He complained also of pain in the loins, extending across the abdomen. He was subject to occasional attacks of chilliness, but his skin was usually hot and dry, and he had a frequent pulse. On introducing a catheter into the bladder, I drew off half a pint of urine, although the patient had made water immediately before the operation. The introduction of the catheter was repeated twice daily; and under this treatment the quantity of urine drawn off gradually diminished; so that, at the end of a fortnight, he was enabled to empty his bladder by his own efforts As the quantity of urine retained in the bladder became smaller, so the secretion became more abundant, until it amounted to two pints or more in the course of the day and night. Under these circumstances the patient returned to his home in the country, and I have had no opportunity of learning in what manner the case terminated.

I attended a gentleman, about seventy years of age, with disease in the prostate. I had instructed him in using the catheter for himself, and he drew off his urine regularly. Some months after I first saw him, he observed that he drew off less urine than usual; and that the whole quantity of urine secreted in the day and night was much diminished. There was no distention of the bladder. The catheter

entered the bladder readily, but drew off only a very small quantity of urine. At last the secretion of urine was reduced to three or four ounces daily, and I believe to less. Now another order of symptoms began to show themselves. The legs became œdematous: this was followed by difficulty of breathing; the patient was almost suffocated, except when his shoulders were very much raised by a number of pillows under them. Then he became drowsy; afterwards comatose, with dilated pupils. There were all the symptoms of effusion of fluid into the chest and ventricles of the brain; and with these symptoms he died. I have no written notes of the case: but if my recollection be accurate, not above ten days or a fortnight elapsed from the time when the diminution of the secretion of urine was first observed to the day of the patient's death. Unfortunately, the relations would not permit the body to be examined.

I was consulted concerning another case, which may throw some light on the one which I have just related, in conjunction with my friend Mr. Stanley. We had some difficulty at first in determinining whether there was actually a suppression of the secretion of urine in the kidneys, or a retention of it in the bladder; and this difficulty was increased by the circumstances of the patient being unusually corpulent; so that, even if the bladder had been a good deal distended, we should have been scarcely able to perceive the usual prominence above the pubes. At last, however, we satisfied ourselves that the catheter drew off no urine, because there was none in the bladder. The patient died, and Mr. Stanley examined the body. He found a growth of medullary fungus immediately behind the internal orifice of the urethra, projecting into the bladder, and extending to the orifices of the ureters. It seemed that this disease, at the termination of the ureters, had impeded the flow of urine into the bladder from the kidneys, both ureters being much enlarged, and distended with urine through their whole extent. The kidneys were very soft and vascular but contained no large accumulation of urine.

As such cases are not generally noticed by surgical writers, I shall not think that I occupy your time unnecessarily in mentioning the particulars of another, which, allowance being made for the difference of the original disease, is similar to those which I have just described, and will serve to illustrate further the influence which an obstruction of the ureters exercises over the functions of the kidneys. I was desired to visit a gentleman between forty and fifty years of age, who was represented to me as having been long troubled with a stricture of the urethra, and as labouring at this time under a retention of urine in the bladder. On introducing a small catheter, I discovered an obstruction of the membranous portion of the urethra, but with some difficulty I made the instrument enter the bladder. The patient had voided no urine for the two or three previous days, nevertheless not more than a few drops were drawn off by the catheter. The operation was repeated two or three times afterwards, and with the same result. At this time the patient was perfectly sensible, and gave Sir Henry Halford, Dr. Somerville, and myself a distinct history of his

complaints. In the course of the next twenty-four hours, however, his mind began to wander, and at the end of three days more he died comatose.

On examining the body, we discovered a very narrow gristly contraction of the urethra, which was evidently a disease of long standing. The urethra behind the contraction was much dilated. The whole of the soft parts behind the stricture, surrounding the urethra, prostate gland, and bladder as far back as the ureters, were much thickened, agglutinated, and indurated, apparently from the effusion of lymph at some former period, which had become organized. This change from the natural condition was greatest where the right ureter enters the bladder, and the orifice of this canal was in consequence so much contracted that scarcely the smallest probe could be introduced into it. The whole of the right ureter, above the contraction, was dilated to the size of the small intestine, the mucous membrane being thicker than under ordinary circumstances, and the inner surface bearing marks of slight inflammation. The orifice of the left ureter was also contracted; but in a less degree than that of the right; and the ureter itself dilated to two or three times its ordinary size.

Both kidneys were unusually vascular, and of a soft consistence. In the right kidney there were two cysts containing serum, not communicating with the infundibula. A small quantity of discolored fluid was found in the pelves; but there were not races of urine either in the kidneys or ureters, or bladder. The *vesiculæ seminales* were involved in the mass of organized lymph which surrounded the neck of the bladder, and converted into a gristly mass, with scarcely any remains of their natural stricture. The ventricles of the brain contained an ounce and a half of serous fluid; and about four ounces of fluid were found in the cavity of each plura.

3. In cases of diseased prostate gland, as in all other cases in which there has been for a long time a considerable impediment to the flow of urine from the bladder, the ureters are liable to become dilated, the pelvis of the kidneys and infundibula being dilated afterwards. I shall describe this peculiar change in the structure of the kidney more at length when I call your attention to the subject of renal calculi.

4. In other cases, both of stricture of the urethra and of enlargement of the prostate gland, the kidneys become diseased in consequence of inflammation which had begun in the mucous membrane of the bladder, extending upwards to those organs along the ureters. The morbid appearances, which the kidneys present under these circumstances, have been already described in the Lecture on diseases of the bladder.

5. But it is not uncommon in cases of stricture of the urethra for the kidneys to exhibit on dissection appearances of disease, although the membrane of the bladder and ureters is but little altered from its natural condition. These appearances are such as chronic inflammation might be expected to produce, where it had not been preceded by inflammation extending up the mucous membrane; and they do not in any material degree differ from those which I described in the fifth

Lecture, when I drew your attention to that peculiar class of cases in which there are symptoms of irritable bladder arising from disease in the kidneys.

In all the cases which have been just enumerated the ureters are affected in the same manner, being in a greater or less degree dilated, but one generally more than the other; while the effects produced on the kidneys vary according to circumstances. Thus where the obstruction to the flow of urine is of such a nature as to operate directly on both ureters, the result is a complete suppression of the urinary secretion; but where the cause of obstruction is more remote from the kidneys, the bladder, which is a dilatable organ, being interposed between them, the result is the gradual production of a disease of the kidneys, which, if not inflammatory in the beginning, very soon assumes that character, running the ordinary course of chronic inflammation afterwards.

Where the disease of the kidneys has been preceded by inflammation of the mucous membrane of the bladder and ureters, the adhesive alkaline mucus which it contains forms the predominant character of the urine. But in the other class of cases, the urine is voided turbid, with small flakes of lymph floating in it. It exhibits abundant indications of the presence of albumen on being tested with nitric acid, or heat, and it sometimes deposits pus. In all cases, as the disease in the kidneys makes progress, it gives origin to an order of symptoms quite different from those which mark the early stage of the disease of the prostate gland, and which I need only briefly enumerate, as they very nearly correspond to those which I have already described in the concluding part of the last Lecture. The patient complains of an uneasy sensation in the loins, which at last amounts to considerable pain. He feels as if the back required support, and places a cushion behind him for that purpose. Then there is pain extending across the anterior part of the abdomen near the hypogastrium, and sometimes pain, and even chronic inflammation and enlargement, of one of the testicles. By degrees the local disease affects the general system. The patient is observed to be languid and listless; he dislikes exertion, and scarcely pays any attention to things which he would formerly have regarded as objects of the greatest interest. The pulse becomes feeble; the hands and feet are cold; the stomach refuses food; there is an incessant nausea and sickness: one or two rigors probably occur, which are followed by still more marked symptoms of debility, which gradually become aggravated, until they terminate in death.

Besides the more manifest and important consequences of the chronic enlargement of the prostate gland, which I have already described, and which are to be attributed to the connection of the part diseased with the urinary organs, there are others less dangerous, but sufficiently distressing, which arise from the contiguity of the prostate to the rectum. When this gland is only slightly enlarged, it produces no inconvenient pressure on that bowel, but when the enlargement is considerable, there is a constant sense of weight and bearing down,

and the patient has a feeling which leads him to think that he has occasion to evacuate his fæces, although the rectum is empty. I attended an old gentleman who suffered from this kind of tenesmus for some years before he died, and to such an extent as to be rendered quite unfit for living in society. Slighter cases of the kind are not of unfrequent occurrence. The patient usually attributes the sensations which he experiences to internal piles; and, indeed, this last-mentioned disease is often met with in those who labor under enlargement of the prostate, being probably produced by the pressure of the tumor on the larger hæmorrhoidal veins. I have already mentioned a case in which an abscess of the prostate burst into the rectum. In this instance the abscess formed a second time, and again made its way into the bowel; after which it soon healed, and the patient had never any further inconvenience from it.

LECTURE VIII.

Treatment of the Chronic Enlargement of the Prostate Gland.

If you bear in mind that the chronic enlargement of the prostate gland to which I called your attention in the last lecture, it is not an accidental disease, but one of a series of natural changes which the system undergoes after the middle period of life, you will not be surprised to find that it is but little under the dominion of art. When from any cause the vessels of the prostate are more than usually turgid with blood, the quantity of blood which they contain may be diminished, and thus a reduction of size, to a certain extent, may be effected. It is with this view that we recommend topical blood-letting, the exhibition of gentle purgatives, a moderate diet, and, above all, perfect rest in the horizontal posture. But we are not acquainted with any method of treatment which is capable of restoring the gland to its original condition. I need not occupy your time with a description of all the experiments which I have known to be made with a view to this result, as it would be only to give you a history of their failure. As, however, I have already referred to a case of enlargement of the prostate occurring in early life, in which great advantage seemed to arise from the exhibition of the iodide of potassium, it is right that I should mention that no experience which I have had would lead me to believe that this medicine is useful in cases of the chronic enlargement of that gland in older persons.

Nevertheless, in these cases, much may be done by means of proper surgical treatment. The prostate of a man advanced in life cannot be rendered like that of a young man, any more than his grey hairs can be converted into black: but the train of evils which the enlarged prostate produces by its influence on the urinary organs may

be, in some instances, altogether prevented, and in others very much diminished, so as to remove the patient from a state of extreme, and even immediate danger, to one of comparative security.

In considering the treatment by means of which this object is to be attained, we will suppose, first, that you are called to a patient laboring under a complete retention of urine in the bladder.

The treatment of retention of urine from diseased prostate is one of the most important subjects in surgery. The patient suffers miserably; his life is at stake; he lives or dies according to the skill which you are able to exercise in his favor. The case is altogether different from one of retention of urine from stricture. Bougies are of no service: even if you pass one into the bladder, no urine follows; the parts collapse and close as the bougie is withdraw.

Neither is laudanum useful in these cases. Here is no spasm for laudanum to relieve. If it produces any sensible effect, it is that it makes the patient less sensible of pain: it makes him think himself better than he really is. It deceives him and his friends for a time, but it does nothing towards curing the retention.

When the retention of urine has taken place suddenly, in consequence of a sudden addition to the bulk of the prostate, the patient may derive advantage from losing blood. He may be bled in the arm, or cupped in the loins; and I have known this in a few cases to be of itself sufficient to enable him to make water. But in the very great majority of cases the retention can be relieved only by the use of the catheter.

I rarely use any but a gum catheter. It gives you rather more trouble to learn the use of the gum cathether, and to become dexterous in the management of it, than it does to learn the use of the silver catheter. When, however, you have once become familiar with the gum catheter, you will generally prefer it to the other; and there is always this advantage in it, that, when you have succeeded in introducing it into the bladder, it may, if necessary, be allowed to remain there. A gum catheter may be retained in the urethra and bladder with very little inconvenience to the patient, which is not the case with a silver catheter.

As Sir Everard Home has observed, the gum catheter may be used in two ways; without a wire or stilet, when it is a flexible instrument; or mounted on an iron stilet, in which case it is inflexible. You should be provided with a number of gum catheters, mounted not on small flexible straight wires, like those usually sold by the instrument makers, but on strong iron stilets, having the curve of a silver catheter. The stilets which belong to the larger gum catheters should have flattened iron handles, resembling that of a common sound. Let your gum catheters be kept thus prepared for a considerable time before they are wanted for use. They will then become fixed in the proper curvature. With the stilet such a catheter is as inflexible as if it were made of silver: without it, it is capable of retaining its shape to a certain extent; yet it is flexible.

I always begin with passing such an instrument as this first. If the

gum catheter, without the stilet will enter the bladder, it is so much the better. It gives the patient no pain: it is incapable of lacerating the urethra, or producing hæmorrhage: it may do all that is required; and it can do no harm, even in a rough hand. If you fail in introducing it, the failure will not make it more difficult to pass another instrument afterwards. In difficult cases, indeed, the gum catheter without the stilet will not succeed. You must then use your gum catheter mounted in the way which I have already explained.

You ought not to use a catheter so large as to give pain; but for the most part you will find one which is large enough to fill the urethra, without stretching it, to be more easy of introduction than a smaller one. A very small catheter approaches to a pointed instrument, and the extremity of it is liable to become entangled in the tumor of the prostate. The stilet ought to be considerably curved. The reason of this is obvious. The tumor which projects into the bladder, and which affords the principal obstruction to the catheter, is situated at the posterior part of the inner orifice of the urethra. A catheter which is slightly curved comes directly in contact with this tumor. In a catheter which is much curved, the point is directed forward towards the pubes, and it avoids the obstruction behind. Always bear in mind, in introducing the catheter, that it is to be used with a light hand. It should be held as it were loosely in the fingers. It will then, in great measure, find its own way, in that direction in which there is the least resistance. If you grasp it firmly, it can go only where you direct it, and it is likely to puncture and lacerate the membrane of the urethra, and the substance of the prostate, and to make a false passage, instead of entering the bladder.

I generally find that I introduce the catheter best by keeping the handle of it at first close to the left groin of the patient. I pass it as far as possible in this position; then I bring the handle forwards, nearly at a right angle to the pubes, and not elevating it towards the patient's navel. The next thing is to depress the handle, which is to be done gently and slowly, by placing a single finger on it, and pressing it downwards towards the space between the thighs.

In depressing the handle, you generally find the point of the catheter slide into the bladder. Sometimes, however, this does not happen until you withdraw the stilet; and, in the act of doing this, the introduction of the catheter is completed.

Other artifices are necessary, in difficult cases, to enable the catheter to reach the bladder. It may be useful to bend the point forward as it approaches the prostate, either by means of the finger in the rectum, or by pressure made on the perineum. In many instances, the introduction of the catheter will be best accomplished by taking care, while you depress the handle, to keep the concave surface closely pressed against the arch of the pubes, so that it may turn round it as a centre.

But it is impossible to explain to you in words all the minute circumstances which practice and experience will teach you, and on which your success in this manual operation will very much depend.

In some cases of diseased prostate, the urethra becomes very irritable, and liable to spasm at the membranous part. This is observed especiallly where several rude attempts to introduce the catheter have been made before you have been called to the patient. Here the gum catheter on an iron stilet is certain to bring on spasm, unless it be handled with the greatest dexterity and gentleness: and sometimes it will induce spasm in spite of all your care; so that you cannot make it pass even to the neck of the bladder. But a gum catheter without a wire, being a softer instrument, is not very likely to produce the same effect; and I have frequently found the following method to be successful:—I have passed the gum catheter as far as it could be made to pass without the stilet: it has probably stopped at the neck of the bladder, that is, at the tumor of the prostate: I have then introduced the stilet into the catheter, without withdrawing the latter from the urethra; and thus having made the catheter, without the stilet, pass through the part which is the seat of the spasm, I have been enabled afterwards, by employing the stilet, to direct the point over the tumor of the prostate into the bladder.

I cannot too strongly impress on your minds the necessity of gentle manipulation in all these operations. To attempt to force the catheter into the bladder is an almost certain method of causing it to penetrate into parts which it ought not to enter, and adds greatly to the difficulty of introducing it into the bladder afterwards. Besides, such rude treatment lays the foundation of much subsequent mischief, in the shape of abscesses in deep-seated parts, from whence the matter collected cannot find a ready exit. Such abscesses are not confined to the substance of the prostate gland, or its immediate neighborhood. I was consulted by a gentleman who had suffered from retention of urine from an enlargement of the prostate some months previously; the catheter having been, as I understood, introduced with considerable difficluty. From that time, whenever a few ounces of urine were collected in the bladder, he had complained of a most severe pain, referred nearly to the situation of the entrance of the left ureter. The patient ultimately died; and on examining the body after death I found a false passage extending from the urethra behind the prostate gland into an abscess between the bladder and rectum, and at the spot to which the pain had been referred.

When the catheter has entered the bladder, and the urine is evacuated, you must pursue one of two courses: either allowing it to remain in the urethra and bladder, secured by a proper bandage, and with a peg in the orifice, so that the patient may relieve himself whenever he has a desire to void his urine; or withdrawing it, and reintroducing it as soon as the bladder becomes again distended. Now, I do not mean to lay it down absolutely as a rule, that you should allow the catheter to remain, but I am certain that it is prudent to do so in the great majority of cases. If you remove it, so abundant is the flow of urine which immediately takes place from the kidneys, that you will find the bladder again loaded, and requiring the re-introduction of the catheter, within five or six, perhaps even within three

or four, hours. It will be necessary to use the catheter again after another short interval; and it will often happen, when there has been no difficulty in the first introduction of it, that there is considerable difficulty afterwards.

You avoid all this by leaving the catheter in the bladder; and there is another advantage in this mode of proceeding. The prostate gland is kept in a state of more complete repose, and in one much more favorable to recovery, so far as recovery can take place, than it would be in, if irritated by repeated introductions of the instrument.

After the catheter has remained in the urethra for some days, you may withdraw it; and if the patient is now able to empty his bladder by his own efforts, it may be laid aside altogether; otherwise, it must be regularly introduced once or twice in a day, or oftener, according to circumstances. Where the enlargement of the prostate and retention of urine have come on suddenly, the patient generally regains the power of emptying the bladder in the course of three or four weeks, and sometimes much sooner; but where the disease has come on gradually, he never regains it completely. In the former case, he may be liable to a recurrence of the retention of urine, at longer or shorter intervals; but in the latter, he is more or less of an invalid ever afterwards.

Before we quit this subject of retention of urine from an enlargement of the prostate, there is ,however, another point to be considered. You will *very rarely* fail, by dexterous management, to introduce the catheter; but you *may* fail, neverthless, in some instances. What is to be done under these circumstances? Are you to puncture the bladder? and if so, in what situation? It will be of no service here to do what some recommend in cases of retention of urine from stricture; namely, to make an opening into the urethra, beneath the pubes. The size of the prostate renders the case unfavorable for the puncture from the perineum, or the rectum. You may puncture the bladder above the pubes, or you may proceed thus:—When all your efforts to introduce the catheter have been unavailing; when you feel the point pressing against the tumor of the prostate, and unable to pass over it; apply some force to the instrument at the same time that you depress the handle. It will generally penetrate through the prostate, enter the bladder by an artificial opening, and relieve the patient; and of course will continue to relieve him, if you allow it to remain in the bladder.

This mode of proceeding has been strongly recommended by some very good surgeons, and I am not aware that it is attended with danger, although it may not be without its disadvantages. There is reason to believe, that in some cases in which this has been done, the natural orifice of the urethra has become so closed that the patient never could void a drop of urine by his own efforts, being compelled to rely wholly on the use of the catheter ever after. Sir Everard Home has published the history of a case of this kind which was attended by Mr. Hunter and himself. You may see the bladder of this patient, with the perforation of the prostate through which the catheter used

to be introduced, preserved in the museum of the College of Surgeons. The inconvenience which I have now described does not, however, exist in every instance. An old gentleman, the only patient indeed in whom I ever purposely perforated the prostate when laboring under a retention of urine, ultimately regained the power of making water, so as to be able to dispense entirely with the use of the catheter.

Let us now suppose a case in which a patient consults you laboring under symptoms that indicate a partial retention of urine in the bladder. He is unable to empty the bladder by his own efforts. You then are to introduce the catheter, and empty it artificially. The remedy seems to be very obvious: yet it had not occurred to surgeons generally, until it was suggested by Sir Everard Home, within the last thirty years; and to him we are indebted for this great improvement in practical surgery. The immediate effect of drawing off the water is to give the patient the greatest comfort. He loses the irritation which tormented him before; he is free from pain; and is no longer harassed by the incessant desire to make water. But the relief is only temporary. In a few hours the bladder is again loaded, and the symptoms return. The catheter is then to be introduced again; and you must continue to introduce it at regular intervals. These intervals will vary in different cases. One patient is quite comfortable if the urine be drawn off twice in the twenty-four hours, while another requires it to be done every six or eight hours. I rarely recommend the catheter to be used oftener than this. If employed six or eight times in the day and night, it is likely to irritate the prostate, and to do harm instead of good. The plan is to be pursued, probably, to the end of the patient's life. It may be distressing to him to be thus dependent on the use of the catheter, but it is the least of two evils. The repeated introduction of it is an inconvenience, but it prevents misery and destruction. Without it, slow inflammation of the mucous membrane of the bladder, extending along the ureters to the kidneys, will supervene; abscess will form in the prostate; and probably stone in the bladder. But where the catheter is used regularly, these evils are at any rate delayed for a considerable time, and in by far the greater number of cases are prevented altogether.

But is the patient to be subject to the daily attendance of a surgeon for the remainder of his life? This cannot be necessary. Let him learn to introduce the catheter for himself. If possible, let him use the gum catheter without the wire or stilet. It is less likely to occasion irritation than a harder instrument, and he can never with this do himself any material injury.

Now, it is this continued use of the catheter, in those cases in which the patient is unable completely to empty the bladder by his own efforts, which constitutes the principal part of the treatment to be employed in ordinary cases of disease of the prostate gland. In some cases nothing more is required; and the patient who is dexterous in the use of the catheter, and who is careful never to neglect the regular introduction of it, passes through the remainder of his life, an in-

valid indeed, but with little or no actual suffering; and dies at last of some other disease, entirely independent of that which exists at the neck of the bladder.

But there are many cases in which this is not in itself sufficient, and in which other treatment is necessary to remove or palliate the distressing and even dangerous symptoms which arise in the progress of the complaint.

When the mucous membrane of the bladder is affected by slow inflammation, the patient complaining of augmented irritation and pain, and the urine depositing ropy, adhesive, alkaline mucus, you are to employ those remedies which I recommended formerly under these circumstances, when speaking of diseases of the bladder; such as small doses of cubebs pepper; the decoction of the *pareiera brava*, combined with tincture of hyoscyamus, and mineral acids; opiate clysters or suppositories; and rest in the horizontal posture. By proper attention, you may generally relieve the symptoms of chronic inflammation of the mucous membrane which occur in consequence of a diseased prostate, when they exist in a moderate degree. When, however, the case has been long neglected, and the inflammation has extended from the bladder to the ureters and kidneys, neither these nor any other remedies will be of real service, and the patient will sink, in defiance of all your skill, under his complicated maladies.

If the patient labors under such symptoms as lead you to believe that there is inflammation of the prostate, which, if it proceeds, may terminate in the formation of abscess, take blood from the perineum by leeches or cupping, administer gentle aperient medicines, and advise the patient to void all but the most moderate bodily exertions. By these means you will often succeed in preventing suppuration from taking place. If abscess, however, be already formed, and has burst in the perineum or into the rectum, nothing is required, or at least nothing can be done, beyond maintaining as much as possible the general health, so that the power of the patient's constitution may be under the most favorable circumstances for repairing the mischief which has taken place. If the abscess has burst into the urethra, or at the neck of the bladder, it is very desirable to avoid, for a time, the frequent introduction of the catheter, the point of which is liable to become entangled in the abscess, producing a fresh attack of inflammation, and perhaps sloughing, of its inner surface, with a train of dangerous constitutional symptoms. Under these circumstances, I generally allow the gum catheter to be constantly retained in the urethra and bladder, until there is reason to believe that the abscess is healed. The catheter used on these occasions should be rather less than the middle size. A catheter, which completely fills the canal of the urethra, may press on the orifice of the abscess so as to interfere with the free discharge of its contents, and thus may increase the evil which it is intended to remove. In some cases, however, after the formation of abscess, the neck of the bladder becomes so tender that the constant retention of the catheter cannot be endured. We have then no alternative; the catheter must be used at stated periods, great

care being taken that its points should not penetrate into the cavity, nor even into the orifice of the abscess.

An abscess which has an external opening is likely to discharge its contents more freely, and therefore heals more readily, than one which has burst into the bladder, or urethra, or rectum. Whenever, therefore, the symptoms lead us to suspect that suppuration is taking place, we should from time to time examine the perineum and scrotum, and not hesitate, where any tumor can be discovered, to make a puncture with a lancet, without waiting for it to present itself at the surface.

In those cases in which there is reason to believe that the diseased prostate is in a state of ulceration, the distressing symptoms which arise are to be combated chiefly by the free use of opium, administered in the form of clysters or suppositories. In some instances, the patient enjoys on the whole more comfort if the catheter be allowed to remain constantly in the urethra and bladder: in other instances it is the reverse, and the catheter must be introduced occasionally, that is, whenever a moderate quantity of urine is collected in the bladder, being withdrawn immediately on the bladder being emptied.

Hæmorrhage from the prostate is to be treated like any other internal hæmorrhage; and it will cease, in ordinary cases, if you take blood from the loins by cupping, administer a saline purgative, and keep the patient on a low diet, and in the horizontal posture. Where the hæmorrhage is unusually great, blood should also be taken from the arm. The object of blood-letting here is to lessen the force of the heart's action; and in some cases it will be right to bleed the patient, even until syncope is induced. Those medicines which operate as styptics when taken internally, and which are useful in cases of hæmorrhage from the lungs, are also useful in cases of hæmorrhage from the prostate. I had a patient with very diseased prostate. A frightful hæmorrhage took place. The usual methods of treatment were adopted, but were of no avail. The skin became pale; the pulse became weak; and the patient was exhausted: yet the bleeding continued. Large qaanti-ties of blood were drawn off with the catheter; nevertheless, the bladder continued to become more and more distended with blood, and was felt prominent in the belly as high as the navel. All other remedies having failed, I gave the patient a dose of the nostrum known by the name of Ruspini's styptic, and repeated the dose two or three times in the course of the next twelve hours. In about half an hour after the first dose was taken, the hæmorrhage ceased, and it never recurred.

I have said that in this case the bladder was distended with blood, forming a tumor in the abdomen as high as the navel; and this great evil remained, although the hæmorrhage had ceased, giving the patient all the torment of a severe attack of retention of urine. In order to relieve him, I left a gum catheter in the urethra and bladder, and at intervals injected some tepid water into the bladder with a syringe. Every portion of water dissolved a portion of the blood; and by means of the same syringe I was enabled to draw the blood, which

was thus dissolved, out of the bladder. By performing this operation in so careful a manner as not to produce any fresh hæmorrhage, and repeating it over and over again, in the course of forty-eight hours I succeeded in emptying the bladder completely of the blood which had been accumulated in it. The patient lived for a year and a half afterwards, and there was no reason to believe that any ultimate harm arose from the bleeding.

So far the treatment of the chronic enlargement of the prostate gland is sufficiently simple. It becomes more difficult, and, a greater degree of circumspection is necessary in forming a prognosis in those cases in which the original disease is complicated with a secondary disease of the kidneys.

Here the first thing to be done is to remove the existing cause of the secondary disease, by having recourse to that treatment which will relieve the primary; and if the disease in the kidneys has made but little progress, you will find that it subsides spontaneously, as soon as the accumulation of urine in the bladder is prevented by the regular introduction of the catheter. If, on the other hand, it be far advanced, it is but too probable that it will proceed to an unfavorable termination, notwithstanding all your efforts to prevent it. Still art may do much in certain cases. If there be a quantity of adhesive mucus in the urine, indicating the existence of chronic inflammation of the mucous membrane, you may administer the decoction of the *prariera brava* combined with the mineral acids, and tincture of henbane, or small doses of the cubebs pepper. If the urine be free from this kind of mucous, but opaque, yellow, albuminous, or depositing pus, you may give the patient the infusion of diosma in the manner which I recommended formerly. At the same time, the powers of the patient should be maintained by means of a nutritious diet, with a limited quantity of ale or wine. If there be much pain in the loins, stimulating liniments of mustard poultices may be applied twice daily, or a blister occasionally. Still the use of the catheter is indispensable, as it would be unreasonable to expect that any remedies should act on the disease in the kidneys, while the cause that has produced it continues to operate.

Yet, however necessary it may be in all cases, there are some in which much discretion is required in resorting to the use of the catheter. What I am about to state is not an opinion formed hastily, but a deliberate conclusion, to which I have been led, after having had for many years, no small share or experience in the treatment of these disorders, as well as considerable opportunities of investigating the morbid appearances which they leave behind them in the dead body. If, in a case of chronic enlargement of the prostate, the patient has been allowed to go on for two or three years, or longer, without the use of the catheter, and, in consequence of this neglect, the quantity of residuary urine in the bladder has gradually increased, so that at last one, or two, or more pints are accumulated in it, the kidneys having at the same time become diseased, the introduction of the catheter, according to the rules formerly laid down, so as to empty the

bladder two or three times daily, is likely to be injurious rather than beneficial. The patient is, it is true, relieved of many of his distressing symptoms. He is no longer tormented by a frequent desire to void a small quantity of urine, nor by an involuntary dribbling of urine during the night ; nor does he suffer the uneasy sensation which, in a greater or less degree, always attend an over-distended bladder ; but, in the course of a few days, it is observed that he avoids his usual exertion, that he seems languid, and loses his disposition to take food. Then the other symptoms of disease in the kidney, which were but imperfectly developed before, become distinctly marked, and he gradually sinks, and dies at the end of a month or six weeks from the time of the catheter being first employed.

I shall describe to you more at length, in a future Lecture, what are the consequences of the operation of lithotomy performed on a person who labors under any considerable disease of the kidneys. At first he is greatly relieved, and often seems to recover rapidly from the effects of the operation ; but, in the course of a few days, his bodlly powers begin to fail, and death ensues at no distant period ; and this happens even where the stone has been of a small size, extracted in the shortest possible space of time, and with the least possible injury to the parts concerned. The resemblance between the effects produced by the use of the catheter, in the way, and under the circumstances, which I have just endeavored to describe, and those which follow the operation of lithotomy in a patient similarly circumstanced, is too obvious to be overlooked, and I conclude that they are to be referred to a common principle. The system suffers from the shock of the operation, in one case ; and in the other case it suffers in the same manner from the impression made on it by the sudden emptying of the over-distended bladder, and consequent removal of the pressure which is made, through the medium of the dilated ureters, on the glandular structure of the kidneys.

Here, then, arises an important practical question. The patient has no chance of recovery without the use of the catheter. Are we to leave him to his fate ? or are we to empty his bladder at certain intervals, at the risk of hastening the period of his dissolution ? I have no doubt that we may, in many instances at least, obtain the good and avoid the evil, by a slight modification of the treatment. Let the catheter be introduced at first so as to draw off only a portion of the contents of the bladder, and let several days be permitted to elapse before it is completely emptied ; care being taken, at the same time, to uphold the general health by the exhibition of ammonia, quinine, and other tonics, exhibited according to circumstances, and combined with the prudent use of wine or brandy and a plain but nutritious diet.

Scirrhus of the Prostate Gland.

I have observed that malignant diseases of the prostate are of rare occurrence. I have, however, seen cases in which I could not well

doubt that the prostate was affected by schirrhus, although I had no opportunity of positively ascertaining the fact by dissection.

In February, 1831, a gentleman from Maidstone, fifty years of age, consulted me under the following circumstance :—

He complained of a too frequent indication to void his urine ; so that he was disturbed not less than ten or twelve times in the course of the night. The act of voiding it was attended with some degree of difficulty ; and occasionally he observed that it could not be accomplished in the position in which he then was, and he was under the necessity of altering it. A small quantity of urine sometimes flowed involuntarily after he thought that his bladder was emptied. He suffered a severe and constant pain, extending from the left groin across the lower part of the abdomen, above the pubes, and also down the thigh and leg. The pain above the pubes was aggravated during the effort to make water. He compared the pain in the thigh and leg to that which he suffered when he had sprained his thumb, and said that it prevented his throwing the weight of his body on that limb when he stood erect. There was an enlarged and indurated gland in the groin, to which the pain was referred. The urine was high coloured, but otherwise in a healthy state, free from mucus and albumen. A catheter having been introduced after he made water, it was ascertained that there was no obstruction in the urethra, and no residuary urine was found in the bladder. He had lost flesh, and had the aspect of a person laboring under a malignant disease. He was hot and feverish at night, and the pulse was never less than 100 in a minute. The prostate gland being examined from the rectum, was found not very much enlarged, but of stony hardness.

The symptoms which I have described first showed themselves in the preceding August, and had gradually increased up to the time of my being consulted.

It appeared to me that the circumstances of this case could not well be explained, except on the supposition of the prostate gland being affected with the true scirrhus disease; and Mr. Travers, who was consulted, also came to the same conclusion.

The patient returned to Maidstone, and died shortly afterwards. There was no opportunity of examining the body after death.

Another case fell under my observation, in which, also, I was led to believe that the patient labored under scirrhus of the prostate. I preserved no notes at the time, but I know the following history to be accurate as far as it goes.

A gentleman, about sixty years of age, who had been long in India, consulted me a few years ago, respecting what appeared to be a chronic enlargement of the prostate gland. There was nothing unusual in his symptoms, and I merely recommended to him the regular use of the catheter. From this treatment he derived much benefit, and he persevered in it ever afterwards.

It was not less than five or six years after this period that I was requested to see him again, in consultation with Dr. Latham and Mr. Mawdslay. He now could void no urine without the assistance of the

catheter. There was a constant and most severe pain referred to the neck of the bladder, which was not relieved on the urine being drawn off. The urine deposited a considerable quantity of adhesive mucus, and was of an ammoniacal odor. The prostate gland, examined by the rectum, was found to be much enlarged, and of a stony hardness. From these circumstances we were led to suspect that the prostate had become affected with a true scirrhous disease; and, in confirmation of this opinion, we found the patient complaining of excruciating pains in various parts of the body, sometimes in one part, sometimes in another, which could be compared to nothing except the pains under which persons afflicted with carcinoma occasionally labor. Altogether, I may say, that I have never seen a human being whose sufferings were more intense; and they were scarcely mitigated by the exhibition of very large doses of opium. I continued to visit him occasionally, in consultation, for nearly a year, at the end of which time he suddenly lost the use of the muscles of his lower limbs, and died in a fortnight afterwards. Permission was not obtained to examine the body; but it is worthy of notice, that a lady, whose case is related in the eighth chapter of the last edition of my work on Diseases of the Joints, and who had long labored under carcinoma of the breast, died after a similar attack of paralysis of the lower limbs, and that in her it was ascertained by dissection, that the cause of the paralysis was a conversion of the bones of the spine into the scirrhous structure.

LECTURE IX.

On Urinary Calculi.

The urine in its natural state is composed of a number of ingredients, which are maintained in solution as long as they preserve the temperature of the body. Sometimes, however, it happens that one or more of these ingredients is deposited in a solid form, although the urine has undergone no alteration in its temperature, and even while it remains in the bladder, or in some other of the urinary passages. These deposits may be in the form of small particles, or sand; or in larger masses. We call these latter calculi. Whether there be merely sand, or whether there be actual calculi, the nature of the disease is essentially the same; and it is to these calculous disorders that I call your attention in this and the following Lectures. The subject is one of the highest interest, on account of the number and variety of the phenomena which it embraces; on account of the pain, distress and deep anxiety which the patient suffers; and on account of the great relief which the art of surgery is capable of affording in the majority of these cases.

Of Sand in the Urine.

The urine contains a large quantity of a peculiar acid, first accurately described by Scheele, who gave it the name of uric acid, but to which the name of lithic acid is more commonly applied by the chemists of this country. It was formerly supposed that the pure acid was held in solution by the urine. Dr. Prout, however, has shown that the pure acid is almost insoluble, and that, under ordinary circumstances, it exists only in the form of lithate of ammonia, which is a very soluble salt. It is this, and not the uncombined acid, which causes healthy urine to redden litmus paper. In very cold weather the urine, as it cools, deposits the lithate of ammonia, blended with some other animal matter. It is the lithate of ammonia, also, which forms the principal part of the soft or uncrystallized sediment deposited in the vessel by the urine of persons who labour under dyspepsia, and some other bodily ailments.

Now, if you add to healthy urine some kind of acid, for which ammonia has a stronger affinity than it has for the lithic acid, the juice of a lemon for instance, the lithate of ammonia is no longer precipitated; but in its place you find a number of small crystals, resembling particles of Cayenne pepper, sometimes of a brown, but more frequently of a dark-red color, at the bottom of the vessel. These are composed of the pure lithic acid. The lemon juice unites with the ammonia, and the lithic acid, being nearly insoluble, is precipitated. This, which happens out of the body, may happen in the body also. The presence of another acid in the urine causes the lithic acid, even in the bladder, to be precipitated in the form of a red sand. Dr. Prout says that it is usually the lactic acid which produces this effect. However that may be, we find that those who are liable to the formation of acid in the stomach are especially liable to the deposition of the red sand. If the digestion be weak, whether it be that the food itself becomes acescent, or that acid is secreted in too large quantity by the stomach, the red sand shows itself. If the food be indigestible, or if it be taken in too large quantity, the same effect may be produced even in the most healthy person. The free use of fermented liquors, and especially of those which contain acid already, or sugar, which may become acid in the stomach, such as punch and champaigne, leads to the same result. Persons who lead a sedentary life, and who never take exercise so as to produce perspiration, are also especially liable to the formation of red sand. Dr. Philip has made some interesting observations relating to this last point, which are of much practical importance. You will find them recorded in a paper published by Dr. Philip, in one of the volumes of the Medical Transactions of the College of Physicians. It seems as if, during perspiration, something was carried off from the blood in the cutaneous vessels, which would otherwise cause the urine to be loaded with acid. Sir Gilbert Blane long ago observed that a disposition to calculous disorders is frequent-

ly combined with eruptions on the skin (psoriasis), and Dr. Philip's observations will explain the reason of this association.

When the urine contains a superabundant acid, which precipitates the lithic acid sand, it usually is bright and transparent to the eye, and of a copper color, resembling in appearance Madeira wine. In general the patient is troubled more or less with dyspeptic symptoms, and frequently he is liable to gout. Many circumstances demonstrate a close connection between this last disease and the formation of red sand in the urine. The same peculiar constitution, the same luxurious diet, the same inactive life, which makes you subject to the one, makes you also subject to the other. The red sand is composed of crystals of lithic acid in its pure state; while the chalk stones, which are formed in the bursæ and cellular membrane of gouty patients, are composed of the same acid, in combination with soda, and the red or yellow deposit from the urine of gouty persons consists chiefly of the lithate of ammonia.

In the (so called) better classes of society, you will find the deposition of red sand to exist chiefly in adult persons, but in the lower classes you find it chiefly among children. These circumstances are easily explained. Adult persons in affluent circumstances, for the most part, lead a more luxurious and indolent life than their children; while among those of lower condition the diet of the children is frequently unwholesome, and comparatively little attention is paid to the various derangements of the digestive organs to which they are liable.

In many instances the red sand is voided without any particular symptoms to indicate its formation, and the patient discovers the disease only by seeing it in the urine; but at other times he complains of uneasy sensations in the loins, of pain in the groins, and in the course of the urethra; and sometimes a small quantity of blood is discharged from the urethra, in consequence of its being abraded in some one part by the sharp hard angles of the crystals. Where the urethra is irritable and liable to spasmodic affections, the contact of the red sand induces spasm in it, occasioning a diminution of the stream, and even difficulty of voiding the urine. In such cases you in vain endeavour to cure the stricture merely by the use of bougies; but if you employ at the same time such remedies as tend to prevent the formation of the red sand, you cure the stricture easily.

It is of great consequence that you should stop the formation of red sand, both because it is in itself a considerable evil, and because, if neglected, it may lead to the formation of a larger concretion in the bladder. You may generally accomplish this object by conveying alkaline remedies into the stomach, such as potass, soda, lime-water, ammonia, magnesia. Sometimes one, sometimes another, may be preferable, according to circumstances; and sometimes it may be advisable to give them in combination with each other. If the lithic acid be deposited in small quantity, and the bowels are too much relaxed, (which, however, rarely happens in these cases,) lime-water may be useful. In persons of weak bodily powers, who may be supposed to require cordial and stimulating remedies, you may exhibit ammonia.

Dr. Prout recommends the carbonate of potass, in preference to the carbonate of soda, for the following reason:—that the soda, under certain circumstances, will enter into combination with the lithic acid, forming an insoluble salt, as bad as the lithic acid itself; whereas the lithate of potass is perfectly soluble; and if this combination takes place, it will pass off dissolved in the urine. Magnesia, as recommended by Professor Brande, has much to recommend it. Being in itself insoluble, it cannot enter the circulation except it has first become combined with acid in the stomach or intestine; and hence it does not pass out of the system so soon as the alkalies.

I have mentioned the *carbonates* of potass, soda, and ammonia, as these agree better with the stomach, and therefore are more proper to be employed than the pure alkalies. The carbonic acid does not interfere with their medicinal effects. There is a remarkable difference in the effects produced on these disorders by the salts, which contain a mineral, and those which contain a vegetable acid. The sulphates, muriates, nitrates, are of no avail; but the tartrate of potass, the tartarised soda, the common saline draught, composed of nitric acid and potass, all produce the same effect as the pure alkalies, or as the alkalies combined with carbonic acid. This remarkable circumstance was first noticed by Sir Gilbert Blane. Sir Gilbert has also recommended a very efficient method of exhibiting the carbonate of potass in these cases, by giving it in a saline draught with an excess of alkali.

I have said that different doses of the alkaline remedies will be required in different instances. Indeed a good deal of care is generally necessary to adjust the dose to the peculiar circumstances of the individual case. If you give too little of the alkali, the result is not obtained, and the lithic acid is still deposited, although in smaller quantity. If you give too much, you not only prevent the formation of the red sand, but you render the urine alkaline, and a white sand (the triple phosphate of ammonia and magnesia) is deposited in its place. Other ill consequences follow the too liberal exhibition of alkalies. They alter the quality of the blood. After some time the patient is less liable to peterchiæ; he perspires too easily; becomes low-spirited, and less capable than when in health of physical exertion. Magnesia does not produce these effects, at any rate not to the same extent, as no more of it can enter the circulation than what is rendered soluble by its combination with acid in the stomach. Too large doses of magnesia, however, are mischievous in another way, by causing the formation of magnesian calculi in the intestines. These are composed of magnesia mechanically blended with the fæces and intestinal mucus. They are not uncommon in these times, when so many individuals are in the habit of taking magnesia in a careless and profuse manner. I have in several instances known a person to suffer a good deal of distress from such a calculus being lodged in the rectum. But cases have occurred, in which the accumulation of magnesia in the intestine has taken place to a very great extent. Mr. Wilson examined the body of a patient in whom, if I recollect rightly, many pounds of magnesia

were found collected in the colon above a contracted part of the rectum.

In the exhibition of alkaline remedies, then, you must make each case the subject of a distinct experiment; and that the experiment may be more properly conducted, you must, if possible, make the patient enter into your views, that he may assist your practice by his own observations. You should be provided with paper, colored blue by an infusion of litmus ; and also with the same paper, slightly reddened by immersion in a very weak acid. Healthy urine ought to turn the blue litmus paper a little red ; and you should avoid giving alkaline remedies in such a dose as to destroy this property altogether; still less ought you to render the urine alkaline. If the urine turns the red paper blue, the patient is in danger of suffering from a deposition of the phosphates, and the alkalies must be given in smaller quantity.

It is to be further observed, that the time when the urine is most acid, and when the alkalies are most required, is after the principal meal, that is, after dinner. The alkalies are not indeed to be given immediately after dinner, for then they are likely to interfere with digestion ; but three or four hours afterwards. In some cases it is better for the patient to defer taking his medicine until he wakes accidentally in the middle of the night. In many instances, a single dose daily, and that at bedtime, is all that is required ; while in others the magnesia or alkali should be exhibited in the middle of the day also.

It appears to me that it has been the custom of late years to give these remedies in larger quantities than is really necessary. It rarely happens that half a scruple of magnesia, or a scruple of the bicarbonate of potass, is not sufficient to neutralise the superabundant acid in the stomach after dinner ; and, where a second dose is wanted, half this quantity may be given in the middle of the day. The following combination agrees very well with the stomach, and produces a very immediate effect on the urine :—

℞ *Magnesiæ*, gr. vj.
Potassæ bicarbonatis, gr. xij.
Potassæ tartratis, gr. xv —*Misce. Fiat pulvis quoque vespere sumendus e cyatho parvo aquæ.*

But it may truly be observed that this is not striking at the root of the disorder. Alkalies prevent the formation of red sand while they are being taken, but they do not prevent it being formed again as soon as they are left off. The patient cannot well take them forever ; and something further, therefore, is required. When he suffers from costiveness, purgatives must be exhibited ; and even in those cases in which the bowels are not particularly torpid, purgatives are useful. The mercurial purgatives are, on the whole, to be preferred. A blue pill may be administered every night, with a draught of infusion of senna and tartrate of potass every third or fourth morning ; or a calomel pill may be given once or twice in a week, at bedtime, and

the senna draught on the following morning. When the disease is connected with gout, the patient may take the colchicum with great advantage. In the first instance, fifteen drops of the *vinum colchici* may be administered twice or three times daily ; afterwards, a draught of infusion of senna, with a saline purgative, and forty or forty-five drops of the vinum colchici may be given occasionally in the morning, or from one to two grains of the acetous extract of colchicum may be given as a pill for eight or ten successive nights.

But more, after all, is to be effected by attention to diet and mode of living than by medicine. Is the patient a great eater, pampering his appetite by a variety of dishes, and thus exciting himself to swallow more food than his stomach can readily digest ?—let him make his dinner on a single dish, and eat that in moderate quantity. Let him also incline to a diet of vegetable rather than one of animal food ; avoiding, however, undressed vegetables, and especially those which are acid or acessent ; as sallad, oranges, and apples. Does he commit excesses in drinking ?—let him leave off fermented liquors altogether, or take them only in small quantity ; and in particular let him avoid such fermented liquors as, from the sugar which remains unfermented in them, are liable to become acid in the stomach, or which are acid already. The French white wines are injurious in these cases, especially champagne ; but none of them are worse than our own English liquor called punch.

If your patient has been in the habit of dining late in the evening, going to bed soon after a hearty meal, he should alter his habits in this respect ; dining sufficiently early to allow of his food being digested before he retires to rest. If he has led a sedentary life, he should cease to do so ; walking or riding daily, so as to induce perspiration. A person who takes a good deal of exercise may take liberties as to diet, which he could not otherwise take with impunity. For example :—A gentleman of my acquaintance was accustomed to dine daily in convivial society, eating and drinking heartily, and not stinting himself in the use of champagne. But he was of active habits. He rose early in the morning, walked for an hour or two before breakfast, and came home to breakfast perspiring profusely. If by chance, in his morning's walk, he met any one of his friends, his remark was, that he was doing this to distil off the champagne which he had drunk yesterday. By and by some circumstances occurred which altered his mode of life in this respect; and not long afterwards he consulted me concerning two symptoms which gave him some trouble and anxiety: the one, a quantity of red sand in the urine; and the other, a scaly eruption (*psoriasis*) of the skin. He had continued to eat and drink as usual, but he had ceased to rise early, and to take his long walk, which brought him home perspiring to breakfast; and this alteration in his habits was soon followed by the appearances of the red sand and the eruption. A gentleman of my acquaintance, who has for many years indulged himself in very liberal portions of wine daily, and who has lived luxuriously otherwise, nevertheless retaining the most perfect health and cheerfulness, attributes his exemption from

the usual ill consequences of such a mode of life to the circumstance of his being accustomed to perspire profusely during the night.

A copious perspiration may be produced in other ways, as well as by means of exercise. The most certain and effectual method is the use of the sulphur-fumigating, or hot-air bath. The hot-air bath is certainly a great advantage to those persons who, having led an inactive life, are subject to dyspepsia, and those twinges in the limbs, especially in the feet, which sooner or later are followed by a regular attack of gout; and I believe that it may also be employed beneficially in cases in which the patient suffers from a too large proportion of lithic acid in the urine. It is worthy of observation, that the perspiration produced by the hot-air bath is highly acid, reddening the blue litmus paper nearly as much as it is reddened by acid urine. Such, indeed, is the character of the secretion generally, and thus the beneficial effects of a free perspiration are easily explained. As the introduction of any acid into the stomach may promote the development of the lithic acid in the system, so it may be supposed that the abstraction of any acid from the skin may produce the same result. The fact, however, may be explained in another manner. Dr. Prout says that, for the most part, the precipitation of the lithic acid sand is caused by a superabundance of the lactic acid in the urine. But the lactic is the predominant acid in the perspiration. Probably each of these explanations is correct as applied to different orders of cases.

The red or lithic acid sand is not the only sand deposited by the urine. In some instances, the urine deposits distinct white particles, which are minute crystals of a triple salt composed of the phosphate of ammonia and magnesia. Here the urine is not acid, but of an alkaline quality: it turns the reddened litmus paper blue, and, if very alkaline, it turns the yellow tumeric paper brown; or it may be slightly acid when first voided, becoming alkaline as it cools, and having a pellicle on its surface, which shows the prismatic colors, and is composed of the salt just mentioned. According to Dr. Prout, the formation of the white sand takes place in the following manner:—The urine, under ordinary circumstances, contains the phosphate of magnesia, which is held in solution, being a highly soluble salt. But in some cases of disease, the urea of the urine becomes decomposed in the kidneys, and ammonia is evolved, which combines with the phosphate of magnesia, so as to make a triple salt. But the triple salt is insoluble, and, therefore, it is precipitated in the form of a white sand. Dr. Prout observes, also, that the same state of system which leads to the decomposition of urea and the evolution of ammonia leads also to a more abundant formation of the phosphate of magnesia; and hence arises the immense deposition of white sand, which occurs in some cases. Indeed, this is sometimes so great, that the quantity of the phosphate of magnesia, which healthy urine contains, will by no means account for it. I performed the operation of lithotomy on a boy, whose urine, after the operation, deposited such a quantity of the triple phosphate, that his perineum, the inside of his thighs, and the bed clothes, had the appearance of being dusted over with a white pow-

der; and if this was wiped off, the appearance was renewed in the course of a few hours.

The existence of the white sand in the urine is no new discovery: it having been described by writers, under various appellations, even before Dr. Wollaston ascertained its chemical composition. It was not, however, until the investigation was taken up by Dr. Prout, that any just notions were formed as to the peculiar circumstances under which the salt is generated.

The state of the system which leads to the production of alkaline urine, and of white sand, is very different from that which is attended with a too acrid condition of the urine, and the formation of red sand. The latter occurs in individuals who are over-fed, or over-stimulated, and whose vital powers are not expended by exercise; where there is what Dr. Cullen would have called a sthenic diathesis. But the alkaline urine indicates an asthenic state of the system; it is the result of debility. In a person who is exhausted by too severe mental or bodily exertions, or who has long been worn by mental anxiety, the urine becomes alkaline. A gentleman, who was at that time attending these Lectures, called on me, to consult me concerning his general health. After a careful inquiry into the circumstances of his case, I was unable to discover any marks of local disease. It was not one function in particular, but all his functions were deranged. He had been in the habit of sitting up to write out his notes until two in the morning; he had arisen from his bed at six; he had worked all day, both with his hands and with his head; in short, he was suffering from excessive labor of both body and mind. I said to him, "Your case is not one which medicine alone will cure; you must study less, and sleep more. Your system is in a state which will lead you to having alkaline urine, if you have it not already." He went into the adjoining room to make water, and immediately on its being voided, I tested the urine, and found it to be alkaline, as I had anticipated. I mention this case, that the important fact which it illustrates may be well impressed on your minds; but cases corresponding to it are not uncommon.

In many instances, a course of mercury renders the urine alkaline. In some individuals, even a single dose of calomel will produce the same effect. Mercury is what is commonly called a *lowering* medicine, and this seems to explain the principle on which it operates. In a person who is already weak, the further degree of exhaustion, which, is the consequence of the exhibition of an active purgative, will be sufficient to make the urine alkaline. The too abundant exhibition of alkaline remedies will, as indeed might be expected, lead to the same result. Injuries of the spine, affecting the spinal chord, will also be followed by the secretion of alkaline urine. I first observed this fact as long ago as the year 1807, and have taught it in my surgical Lectures from the time that I began to deliver them in the year 1808. Since then the observation has been confirmed, not only by my own experience, but by that of many other individuals. It is remarkable that this effect is equally produced whatever is the part of

the spine that is injured; whether it be the loins, or the back, or the neck; whether the bladder be, or be not, paralytic. It continues even after the patient has recovered of all his other urgent symptoms. I was consulted by a gentleman who had met with a severe injury of the spine more than a year before. Immediately after the accident had occurred, his limbs had become paralytic, but he began to regain the use of them in the course of a few weeks; and when he applied to me he could walk and ride like other persons, but his urine was still alkaline. The same thing occurs where there is disease of the spinal chord independent of mechanical injury. I have lately attended a gentleman who labored (as the *post-mortem* examination proved) under an affection of the lower half of the chord. It had lost its natural structure, and was in that state to which Rostan has applied the name of *ramollisement*. There was some reason to believe that in this case the disease had been induced by excessive venery—that it was a true *tabes dorsalis*. One symptom was a half paralytic state of the muscles of the lower limbs, so that the patient could scarcely walk even with the assistance of crutches;* another was a highly alkaline condition of the urine. In this case, in the commencement of the paraplegia, the urine was unusually acid, and it was only as the paraplegic symptoms advanced that it became alkaline. This confirms a remark which Dr. Prout has made, that alkaline urine is frequently preceded by a too abundant formation of lithic acid. In females who labor under what may be regarded as aggravated hysterical affections, the urine is frequently alkaline, and deposits the triple phosphate in abundance. The same persons are also liable to have the red or lithic acid sand in the urine; and not unfrequently the two kinds of sand alternate with each other. It is astonishing what a quantity, sometimes of lithic acid, and sometimes of the triple phosphate, passes off with the urine in some of these cases.

Those persons who habitually secrete alkaline urine are generally pale and sallow; incapable of much bodily and mental exertion; complaining of lassitude and weariness; and when this state of things has existed for some time, their bowels become irregular, being sometimes too much confined, at other times too much relaxed; and they exhibit other marks of debility. Such is the description of the symptoms connected with the secretion of alkaline urine given by Dr. Prout; and your future experience will enable you to bear testimony as to the general correctness of this statement. There are, however, cases to which it does not apply; and I have at this time under my care a gentleman whose urine is alkaline, and has been so for a considerable time, although his general health is good, and he has no other ailment, with the exception of a costive state of the bowels. The urine, instead of the transparent coppery appearance which it possesses, when

*Some further observations illustrative of the influence of the spinal chord over the secretion of urine, and of the effects produced on the kidneys and bladder, will be found in my memoir on "Injuries of the Spinal Chord," published in the 20th volume of the Medico-Chirurgical Transactions.

it is too acid, is voided slightly opaque; of a pale color, like whey; and being secreted in too large quantity and much diluted, it is of a low specific gravity. The odor is unnatural and disagreeable: sometimes ammoniacal. When allowed to stand, even for a short time, the triple phosphate is deposited in the form of a white sand, at the same time that a pellicle is formed on its surface, which shows the prismatic colors, and which Mr. Brande has ascertained to be composed of the triple phosphate also. If allowed to stand for a long time, the urine becomes putrid, and always smells of ammonia.

Besides the triple phosphate of ammonia and magnesia, another salt, into the composition of which the phosphoric acid enters, is frequently to be detected in the urine; namely, the phosphate of lime. A small quantity of this salt seems to be occasionally generated by a diseased kidney; but by far the greater proportion of it is derived from another source.

Dr. Austin, physician to St. Bartholomew's Hospital, in the year 1791, published a Treatise on Stone in the Urinary Bladder, in which he states, that "the main result of his inquiries has been, that the stone is formed generally in very small part, and often in no degree whatever, from the urine as secreted in the kidneys, but chiefly from mucus produced from the sides of the different cavities through which the urine passes." The late Mr. Chevalier, in the second volume of the Medico-Chirurgical Transactions, published some observations which were intended to confirm Dr. Austin's hypothesis. These notions, however, attracted but little attention, even when first promulgated; nor is this to be at all wondered at, when we consider how much they are at variance with a multitude of well-known facts. Nevertheless, they are not absolutely without foundation. Dr. Austin was in an error, inasmuch as he mistook the exception to the general rule, for the rule itself; but no further. It is true that calculous matter, in by far the greatest number of instances, is a deposit from the urine, but under certain circumstances it is generated by the mucous membrane which lines the bladder, and extends from thence along the ureters to the pelves and infundibula of the kidneys.

I have described in a former Lecture the phenomena which belong to chronic inflammation of these mucous membranes. One of its effects is the secretion of a tenacious ropy mucus in a most abundant quantity. This mucus is highly alkaline, containing the carbonate of soda, which is a soluble salt; containing also the phosphate of lime, which is insoluble. The latter is frequently seen presenting the appearance of white streaks in the mucus. In some cases it is produced in still larger quantity, and it comes away in irregularly formed masses resembling mortar.

According to my experience, such is the most frequent origin of the deposits of phosphate of lime, which take place in the urine. Occasionally, however, they are met with where no signs of actual inflammation exist, and where there is little, or none, of the adhesive mucus. The phosphate of lime then assumes the form of whitish impalpable powder, which falls, like powdered starch, to the bottom of

the vessel. Dr. Prout describes the urine in the majority of these cases as being of a pale color, and of a low specific gravity, though it is sometimes quite otherwise. But even here Dr. Prout is led to believe that the phosphate of lime is furnished by the mucous membranes of the bladder, ureters, and kidneys, and not by the structure which secretes the urine.*

In either of these forms of the disease the phosphate of lime may be generated where there is none of the triple phosphate in the urine, and you will frequently find the urine to be acid when it is first voided even though it deposits an alkaline mucus. If you wait some time longer putrefaction begins, ammonia is evolved, and the whole is rendered alkaline. The triple phosphate of ammonia and magnesia, and the phosphate of lime, have different origins, and either of them may exist in the urine independent of each other. But it continually happens that you find these two varieties of the phosphates co-ex stent in the urine; and this combination is probably produced in one of the following ways:—

1. The primary disease may be a secretion of alkaline urine in the kidneys, and consequent production of the triple phosphate. The alkaline urine is an irritating application to the membranous surfaces with which it comes in contact. If it continues for a certain time, it induces a chronic inflammation of the mucous membrane of the kidneys and ureters, extending to that of the bladder, and the formation of adhesive mucus, containing the phosphate of lime:

2. In other cases, the chronic inflammation of the mucous membrane of the bladder is the primary disease. This cannot exist long without affecting the constitution. It excites, not inflammatory fever, but a low febrile disturbance of the system, attended with much general debility. Such a state of system is very liable to occasion a secretion of alkaline urine in the kidneys:

3. In other cases, the secretion of phosphate of lime by the mucous membranes may be a simultaneous effect of the same unhealthy condition of the constitution, which causes the formation of the triple phosphate of ammonia and magnesia in the urine.

And, in one or other of these ways, it happens that the formation of the triple phosphate, and that of the phosphate of lime, are associated with each other; sometimes one, and sometimes the other, being the original malady.

The treatment of patients in whom the urine deposits the triple phosphate, or white sand, is to be conducted on principles very different from those by which you are regulated where you are required to prevent the deposition of the lithic acid.

The formation of the triple phosphate indicates great general debility. Whatever tends to lower the patient aggravates the malady. Purgatives are to be exhibited with the greatest caution, and mercu-

* I have seen one case in which the phosphate of lime generated in large quantity in a diseased kidney reached the bladder in the form of a thick white paste, the ureter being found in the post-mortem examination distended with a mass of substance similar to that found in the bladder.

rial purgatives especially are to be carefully avoided. All alkaline remedies, such as soda, potass, magnesia, limewater, are to be avoided also. I have frequently known them to be exhibited by those who did not distinguish the different varieties of calculous disorders from each other, and who had a vague notion of alkalies being good for the gravel; and I have seen them productive of the very worst effects in many instances. I know it has been said that these remedies may be useful where the digestion is bad, even though the urine is alkaline; and I have myself seen every now and then a case of this description, in which *small* doses of soda were exhibited with advantage; but I am sure that such cases are to be regarded, not as constituting the foundation of a general rule, but as exceptions to it. Be assured that the rule is, that alkalies are to be avoided. On the same principle on which you avoid alkalies, you are to exhibit acids. This mode of treatment was first suggested by Dr. Wollaston. Mr. Brande recommended the use of vegetable acids in preference to the mineral. At any rate, these are very fit to be employed where they do not disagree with the stomach so as to interfere with digestion. The patient may drink lemonade, or eat oranges or lemons, in such quantity as he finds necessary. If the vegetable acids, however, as frequently happens, do not agree with the stomach, the mineral acids may be given instead. The dose of the acid must depend on circumstances, and you must regulate it by making frequent examinations of the urine with the reddened litmus and yellow tumeric paper. From five to ten minims of muriatic acid, given three times daily, will generally be sufficient; but in extreme cases you may give as much as thirty or forty minims, or even more, of the strong nitric acid, in the course of the day, sufficiently diluted with syrup and water. The effect of these large doses of nitric acid in correcting the alkaline quality of the urine is most remarkable. I shall mention to you what happened in the first case in which I prescribed them as an experiment. A young man consulted me, laboring under great irritability of the bladder, the consequence of a highly alkaline state of his urine. The urine was voided turbid, of no offensive ammonical odor, depositing a large quantity of the phosphates so as to encrust the chamber-pot, and turning the tumeric paper of a brown color. He was at the same time looking ill, languid, and debilitated. These symptoms were the manifest consequence of over-exertion of body and mind. I prescribed forty-five minims of the strong nitric acid, with an ounce of syrup of orange peel and some tincture of henbane, to be taken daily in a pint of water. The change produced in the urine was immediate. It assumed a better appearance in the course of a few hours; and when I saw the patient again at the end of four days, it had become actually acid, the general health being at the same time manifestly improved.

In these cases all kinds of tonic medicine are likely to be useful, such as bark, sulphate of quinine, bitter infusions, sulphate of iron, the tincture of the muriate of iron, &c. The diet should be plain, but rather generous, and, at the same time, such as is easy of diges-

tion; consisting of a due mixture of animal and vegetable food. Fermented liquors may be taken in moderate quantity; and, for the most part, the acid wines, as Hock, Moselle, or Chably, will be preferable to others. Dr. Prout has pointed out the good effects of opium, henbane, and other narcotics. If opium does not interfere with the digestive functions, you may give it in doses from half a grain to a grain twice or three times daily. In general, in these cases, opium agrees with the patient, and the tongue remains moist, and the digestion unimpaired, under its use. In addition to these remedies, the patient is to avoid all severe exertion, whether mental or physical; and he should be kept as free as possible from all causes of anxiety, his mind being agreeably occupied by some light employments which do not require any considerable exercise of attention. Courses of mercury, and even a single dose of mercury, are likely to be injurious, as is the case also with antimony, and other diaphoretics, and with drastic purgatives.

When the phosphate of lime is deposited by the urine in the form of an impalpable powder, with little or no increase of the mucous secretion, I usually prescribe mineral acids, although, according to my experience, they are much less influential in these cases than in those in which the urine contains the triple phosphate. They may be combined with other tonics, or with such remedies as may seem best calculated, according to the peculiar circumstances of the individual case, to improve the general health.

Much more may be done in those cases in which the phosphate of lime is deposited in consequence of a ropy mucous secretion from the mucous membrane of the bladder. Here you are, in the first instance, to endeavor to remove the cause on which the secretion depends; namely, the chronic inflammation of the membrane. I must refer you here to the observations which I made in one of my former Lectures, briefly recapitulating, however, what I then said on the subject. Bleeding not only does not tend to diminish the inflammation, but is actually injurious. The first thing to be done, is to discover the cause of the inflammation, and to remove it if possible. It may depend on stricture of the urethra, and may be relieved immediately on the stricture being dilated with a bougie. It may depend on a partial retention of urine in the bladder, in consequence of an enlargement of the prostate gland. The bladder must then be emptied artificially by the introduction of a gum catheter once, or twice, or three times daily. It is seldom advisable in these cases to keep the catheter constantly retained in the bladder, for then the catheter becomes in itself a source of irritation, keeping up the inflammation of the bladder, and adding to the cause on which the deposition of the phosphate of lime depends. Perfect rest in the horizontal posture, opiate clysters, or suppositories, opium, or the extract of henbane, or lettuce, given by the mouth, will be useful also. The exhibition of the decoction of the root of the *pareira brava* is, in many instances, productive of excellent effects. It has a remarkable influence over the secretion of the ropy alkaline mucus. Injections into the bladder of

warm water, and even of a weak solution of nitric acid, are sometimes useful; but of the cases in which these last remedies are to be recommended, I shall speak to you more particularly in a future Lecture.

Where these two diseases, namely, the secretion of the triple phosphate of ammonia and magnesia by the kidneys, and of the phosphate of lime by the bladder, are co-existant, (and this, as I have already explained, is a very common occurrence,) you must combine the two modes of practice, which I have just described, with each other. They are quite compatible; and, in fact, there are very few of the remedies which are useful in the one case, which are not also useful in the other.

Besides those which have been already described, you will occasionally meet with a deposit from the urine, consisting of the lithic acid sand and the triple phosphate, blended together in various proportions. The quantity of these mixed deposits is sometimes enormous. A lady who labored under some aggravated hysterical disorders used to void as much as would fill a table-spoon, or even more in twenty-four hours. In other cases you will find a patient voiding sometimes the pure lithic acid, and at other times the pure triple phosphate. The treatment of such cases is very perplexing. If one disease be already predominant, it may be attended to, to the exclusion of the other. If neither be predominant, you can proceed on no better principle than that of allowing the urinary disease to take its course, while you use your endeavour to improve the general health, which in such cases is always much deranged.

Dr. Prout has described an order of cases, in which the urine deposits the lithate of soda in masses of sufficient size to block up the urethra, and occasion considerable difficulty in voiding the urine. The lithate of soda is the salt which forms gouty secretions; and the cases alluded to were supposed to have occurred in persons of gouty constitution. For further information on this subject, as well as for a more ample history of the pathology and treatment of urinary deposits generally, I must refer you to Dr. Prout's elaborate and profound "Treatise on Stomach and Urinary Diseases."

LECTURE X.

Renal Calculi.

I SHALL now call you attention to those larger concretions which

are formed, and asually retained, during a longer or shorter period of time, in the kidneys, and which are therefore denominated renal calculi. Some of these are of frequent, and others are of rare, occurrence.

1. The most common variety is that which is composed of pure lithic acid. These are generally of a compact texture, laminated internally, and of a light brown color. In other respects they present very different characters in different cases. One person will void one every now and then of an oval shape, varying from the size of a pea to that of a horse-bean, tolerably smooth on the surface. Another will void several at a time, perfectly spherical, having the appearance of hemp seeds. In other cases the figure of the calculus is irregular and the surface rough.

Dr. Prout is led to believe that the lithic acid forming a calculus of this kind is secreted by one of the mammillary processes of the kidney in a semi-fluid state; that it afterwards becomes hard, the semi-fluid mass contracting in bulk as the hardening process proceeds. In Dr. William Hunter's Museum, which was formerly in Windmill Street, but which is now in Glasgow, there are several interesting preparations illustrative of this point in pathology. In some of them the mammillary processes having been longitudinally divided, the *tubuli uriniferi* are seen blocked up with calculous matter; and in one of them the development of the calculus being farther advanced, it is seen partly imbedded in the apex of the mammillary process and partly projecting into the *infundibulum*. These preparations go far towards confirming Dr. Prout's doctrine, as we cannot well suppose the calculous matter in the *tubuli* to be in an actual solid state.

Lithic-acid calculi may be generated in the kidney in persons of any age, but they are much more common in those who have passed the middle period of life than in younger persons. We meet with them most frequently in those who have led luxurious and indolent lives, and who previously have been subject to deposits of lithate of ammonia or of lithic acid sand in the urine. It is this class of individuals that are especially liable to gout, and there is an evident connection between these two diseases. A patient may have been in the habit of voiding lithic-acid calculi; he becomes affected with the gout, and the formation of the calculi ceases. In a few cases the two diseases go on together. But I do not remember an instance of a gouty patient who was troubled with the gouty concretions, commonly called chalk-stones, being also troubled with lithic-acid calculi. These gouty concretions are composed of lithic acid combined with soda; and if the lithic acid be secreted into the joints it cannot be secreted from the kidneys. Some persons void an immense number of this kind of lithic-acid calculi: I am almost afraid to say how many I have known to be passed by one individual—probably several hundreds, of all varieties of size.

2. The renal calculi next in order of frequency are those composed of the oxalate of lime. These are usually of a dark color, of an irregular shape, with a number of small protuberances on the surface,

presenting somewhat of the appearance of a mulberry, and hence denominated *mulberry calculi*.

Calculi of this description are much more rare than those composed of the lithic acid. It is not merely that the disposition to form them exists in fewer individuals, but that where it does exist they are not generated in the same numbers as the lithic-acid calculi. A patient may void one of these calculi and never void another, or he may void a second after the lapse of many years. In one instance, however, on examining a body after death, I discovered as many as five or six calculi of oxalate of lime in one kidney. In this case there was extensive suppuration and complete disorganization of the glandular structure of the kidney, and this local disease was the immediate cause of death.

The researches of Dr. Prout have led him to believe that the oxalate of lime calculus is not generated in a perfectly healthy kidney, and that two conditions are necessary to its formation: the first, that the oxalic acid should exist in the system, and be secreted with the urine; the second, that lime, in some shape or another, (that is, the phosphate of carbonate,) shall be furnished by the mucous membrane of the *infundibulum*. According to my experience, disorganization of the kidney occurs in a much greater proportion of cases of calculus composed of lithic acid. I formerly believed that this arose from the oxalate of lime calculus being especially irritating to the parts with which it lay in contact; but since I have been made acquainted with Dr. Prout's observations on the subject, I cannot but suspect that I mistook the effect for the cause, and that the existence of the diseased kidney gives rise to the calculus, rather than the calculus to the diseased kidney.*

3. The triple phosphate of ammonia and magnesia is sometimes deposited in the kidney; but I have known only one instance of a renal calculus being entirely composed of this substance, and I conclude, therefore, that this is a very rare occurrence. But it very frequently happens, where a calculus has been lodged in the kidney for a considerable time, that the triple phosphate constitute its external layer while the nucleus is either lithic acid or oxalate of lime. How this happens will be explained hereafter, when we consider the subject of calculi of the bladder.

4. Calculi, composed of phosphate of lime, are occasionally formed in a diseased kidney, probably not from the urine, but from the other secretions of the affected organ. In the museum of St. George's Hospital there are two kidneys, taken from the same subject, completely filled with calculi of this description, the glandular structure having almost wholly disappeared. A gentleman voided a small renal calculus composed of the oxalate of lime. Soon afterwards, it was evident that he had disease of the kidney, and in the course of another year he voided another calculus, composed of the phos-

* The oxalate of lime, however, not in all cases formed in the manner just stated. Mr. Cross, in his treatise on Calculous Disorders, describes a case in which the crystals of this salt were detected in the *tubuli uriniferi*.

phate of lime. He ultimately died of extensive disease of the kidney.

We are indebted to Dr. Prout for the explanation of the origin of the renal calculus of phosphate of lime. All that I have seen of these cases satisfies me that his views are correct; but it will be sufficient for me to refer to a very interesting case recorded by Dr. Prout himself. He examined the body of a gentleman who died of extensive disease of the kidneys. He found in each of them large deposits of calculous matter; some contained in natural cavities, to which the *urine had access;* others in cysts, which were the products of disease, and to which the *urine had not access.* The former of these deposits consisted of the phosphate and carbonate of lime, with an admixture of the triple phosphate of ammonia and magnesia, while the latter consisted of the phosphate and carbonate of lime only.

It is worthy of notice, that the phosphate of lime constitutes the earthy matter deposited in consequence of disease in other structures, as in the arteries, the lymphatic glands, the valves of the heart, the lungs, the dura mater, and sometimes even in the uterus.

5. The formation of a renal calculus, composed of the cystic oxide, is a very rare occurrence. I have nothing to say respecting it from my own experience. For what little is known on the subject I refer you to Dr. Prout's treatise.

The late Mr. Earle published a paper, in the Medico-Chirurgical Transactions, in which he endeavors to show that the formation of renal calculi may frequently be traced to a local injury affecting the loins and kidney. I would advise you to read the paper itself, which contains much interesting information. The only observations which I have to offer on the subject of it at present are those which follow:—

First. Where a disposition to form calculi exists, a mechanical injury may (I doubt not) determine the disease to one kidney rather than to the other; but this disposition is so manifestly connected with a peculiar state of the system, and peculiar habits of life (especially in cases of lithic-acid calculi), that we seem to be scarcely justified in regarding it as arising altogether from the agency of a local cause.

Secondly. It is not improbable that, in some cases in which a mechanical injury has preceded the formation of calculi in the kidney, the first effect of it has been to occasion disorganisation of the glandular structure, and abscess; and that the calculi generated under these circumstances have been composed of the phosphate of lime, derived, not from the natural secretion of the urine, but from the morbid secretions of the diseased part; and corresponding, as I have just explained, to the concretions of the same kind which are met with in other diseased textures.

Dr. Prout describes the formation of a lithic-acid calculus in the kidney to be, in many instances, preceded by a disordered state of the general health, bearing a close resemblance to what occurs in gout, and attended with a scanty secretion of high-colored urine. That the lithic acid, while in the circulation, should act as a *materies morbi*, and that the symptoms to which it gives rise should be relieved as

soon as the poison which produces them is expelled from the system, is probable enough. It must be owned, however, that both this and the calculus of oxalate of lime are frequently generated in the kidney without any premonitory symptoms of sufficient consequence to attract the patient's notice. Not unfrequently, indeed, the patient does not suspect that he labors under any kind of disease, until he finds a small calculus expelled with the urine. At other times, however, the presence of a calculus in the kidney is indicated by a pain in the corresponding loin; extending from thence downwards towards the groin and testicle, accompanied with a sense of weight in the loins, and occasionally with tenderness. After exercise the urine is tinged with blood; and the functions of the stomach are liable to be deranged, with sickness and vomiting. But all these symptoms are subject to great variety. Sometimes the pain is trifling, at other times, very severe; or there may be much pain one day, and little or no pain at all, on another. There is, for the most part, more pain where the calculus is associated with a diseased kidney, than where the kidney is otherwise healthy; this being in conformity with a general law of the animal economy, that in cases of disease, the sensibility of the diseased organ is exalted above the natural standard. It is to be presumed also, that the degree of pain may be influenced by the size, and shape, and situation of the calculus; and that much may also depend on the general health at the time. In some instances the urine is only slightly tinged with blood, depositing it in the form of coffee grounds on particular occasions; while in others, the hæmorrhage is considerable, distinct clots of blood being expelled with it from the bladder. It is a rare occurrence, that the urine should never exhibit any appearance of blood; but even this happens sometimes. Lastly, the gastric symptoms, which I have mentioned, seldom show themselves in the early stage of the calculous formation, although they are not uncommon afterwards, as I shall explain presently.

I have said that a calculus may pass down the urethra, and be at last expelled from the bladder without the patient being conscious that anything unusual is going on. This, however, can happen only where the calculus is of a very small size, or where the ureter has been dilated by the passage of a larger calculus previously. If a calculus be large enough to distend and stretch the ureter in its passage to the bladder, it occasions intense suffering. At first, the pain is referred to the region of the kidney and the groin. It is often very severe; and in that case attended with sickness and vomiting, prostration of strength, cold extremities, a feeble pulse, and a pallid countenance: in short, the patient is in what is commonly called a state of collapse. These symptoms are followed by pain referred to the inside of the thighs and the testicle; and frequently the testicle is drawn upwards to the groin by a spasmodic contraction of the cremaster muscle. The urine is usually secreted in small quantity, of a high color, and the bladder being impatient of its contents, the patient is making water at short intervals, with pain referred to the neck of the bladder. No relief from these symptoms is experienced until the calculus has

escaped from the lower orifice of the ureter, and entered the bladder; but as soon as this has happened, the patient's tortures (for they truly deserve that appellation) are at an end. The time occupied by the passage of the calculus along the ureter varies in different cases, according to the dimensions and figure of the calculus and the impulse which it receives from the current of urine behind it. Sometimes the calculus may reach the bladder almost immediately; at other times it may be lodged in the ureter for many hours, or even for several days. Where the descent of it is thus protracted, the parts to which the pain is sympathetically referred become tender to the touch, and the testicle not unfrequently is actually inflamed and swollen, the inflammation of it continuing for some time after the cause which produced it has ceased to operate.

I shall probably find no better opportunity than this of mentioning a class of cases which you will occasionally meet with among the affluent classes of society, the symptoms of which bear no small resemblance to those which I have just described, although they have a very different origin; and the diagnosis of which is of no small importance in practice. The persons liable to be thus affected are those who lead indolent lives, indulging themselves, at the same time, in all the luxuries of the table. There is pain in the loins, often very severe, extending downwards to the groins; the urine is scanty and high-colored, depositing, as it cools, an abundant red or yellow sediment (lithate of ammonia). It is voided in small quantities, and a scalding sensation is referred to the neck of the bladder as it flows. So far the symptoms a good deal resemble those produced by the passage of a calculus down the ureter; but the absence of pain in the testicle, of sickness and faintness, and the presence of no small degree of symptomatic fever, enable you to distinguish the two orders of cases from each other. The effect produced by the remedies employed will assist you in your diagnosis. The symptoms which have been just described are of a gouty origin, and yield almost immediately to a free exhibition of colchicum; which, however, it is generally more prudent not to administer until after the bowels have been emptied, by the exhibition of some grains of calomel, followed by a draught of infusion of senna with the sulphate of magnesia, or some other saline aperient.

In the majority of cases, a calculus of the kidney finds its way into the bladder soon after its first formation; but in other cases it remains for a considerable time in the kidney, being at last dislodged by some accidental circumstance. For example:—A gentleman somewhat advanced in years, who had observed occasionally that his urine was tinged with blood, was overturned in a carriage in which he was riding with two ladies. It was a large heavy vehicle, which came to the ground with great force, causing those who were in it to be severely jolted. When, after the delay which this necessarily occasioned, he had reached home, he found his bladder much distended, and he experienced a violent desire to void his urine. On his making the attempt, however, no urine flowed, there being evidently a mechanical

impediment. He strained and strained again, and at last the impediment gave way. A renal calculus, which seemed to have the form of one of the *infundibula* of the kidney, was projected with no small degree of force into the chamber-pot, and then the urine flowed in a full stream. In other cases, a stone, which has been long impacted in the kidney, becomes dislodged in consequence of some changes which take place spontaneously in the affected organ, independently of any mechanical injury.

A calculus retained in the kidney produces various degrees of inconvenience to the patient. Sometimes, indeed, it may be said to cause no inconvenience at all, so that calculi are found in the kidney after death, the existence of which had never been suspected during the patient's lifetime. In other cases, the patient complains of pain in the loins, and the urine is occasionally tinged with blood, especially after any jolting exercise, such as riding on horseback. Hæmorrhage from the kidney may be the consequence of various renal affections; of diseases which are, and of diseases which are not, malignant; and it seems sometimes to occur, where there is no actual disease, from a relaxed state of the blood-vessels. Still, in the great majority of cases hæmorrhage from the kidney is connected with a renal calculus; and where there is the exact combination of symptoms which have been just enumerated it is scarcely ever otherwise.

A calculus which is impacted in the kidney goes on increasing in size in consequence of fresh depositions of calculous matter on its surface. Sometimes it grows so large that the escape of it by the ureter is impossible. It occupies at last the whole of the pelvis of the kidney, extending also into the *infundibula*, assuming the shape of the parts in which it is large, and bearing some resemblance in its general appearance to a piece of madrepore. In these cases the external layers are generally composed of the triple phosphate of ammonia and magnesia, while the nucleus is either lithic acid or oxalate of lime, more frequently the former.

It may happen that the pelvis of the kidney is at last so completely occupied by the calculus, that the flow of the urine into the ureter is considerably impeded. The result is similar to what occurs in some other cases of obstruction of the ureter. The urine is accumulated in the infundibula, and these become dilated to a large size, forming membranous cysts; while the glandular structure of the organ is expanded, and in a great measure absorbed, from the pressure which is thus exercised upon it. In some cases you find at last the kidney converted into a large membranous bag, on the surface of which scarcely a vestige of the glandular structure is perceptible, while the interior of it is composed of a number of cells communicating with each other, and all containing urine. In other cases you find the whole kidney wasted, the only remnant of it being a membranous substance adhering to an irregularly-formed calculus. Of course, under these circumstances, no secretion of urine can have taken place from the deceased kidney; but the other kidney supplies its place,

and, like a muscle which is called upon to perform double its usual duty, it becomes increased in size in proportion.

Thus you find the kidney in one instance distended into a large bag, and in another wasted and reduced to the smallest dimensions. If you will take the trouble to consider what must happen to a kidney before it can become thus wasted, you will, I doubt not, agree with me in the opinion that these two different conditions belong to the same series of changes. The urine is collected in the pelvis and infundibula; the glandular structure becomes absorbed; and the secretion of urine ceases. Then the urine previously accumulated is absorbed; and the secretion of urine ceases. Then the urine previously accumulated is absorbed in its turn, and the membranous cyst collapses and contracts, until at last it assumes the form of a mere capsule, in which the calculus remains imbedded. An enlarged kidney forms a tumor, which can be distinctly felt in the abdomen of a thin person. There is reason to believe that tumors having this origin occasionally disappear, and what I have just mentioned may serve to explain how this happens.

A calculus lodged in the kidney not unfrequently induces ulceration and suppuration of that organ. It may be, under these circumstances, that the pus escapes with the urine, and passes into the bladder; and this may happen with little or no constitutional disturbance, the symptoms being local, or of such a nature, as to draw the attention of the surgeon to the bladder rather than the kidney. A lady consulted me concerning what was supposed to be an affection of the bladder. She had frequent desire to void the urine; she voided it, of course, in very small quantity at each time; she complained of a cutting pain referred to the neck of the bladder, and the urine deposited what appeared at first to be a muco-purulent secretion, but which afterwards had all the characters of true pus, like that from an abscess. Things had gone on thus for two or three years, when the patient was attacked by other symptoms, such as indicate the passage of a calculus along the ureter. A large renal calculus (of oxalate of lime) came away, and the original symptoms were relieved. They were not, however, entirely removed, as the urine continued to deposit a very small quantity of pus afterwards. I have alluded to this case, as well as to some others, illustrative of the same fact, recorded by Morgagni, in one of the Lectures on diseases of the bladder.

But much greater mischief than that which I have just described sometimes arises from a calculous which has been long impacted in the kidney. The kidney is of a dark color from excessive vascularity; enlarged in size; softened in its texture; and at last abscesses are formed in its substance. Sometimes the abscesses burst from time to time into the ureter, their contents being then expelled with the urine, but not without causing considerable distress to the patient, both as they enter the bladder and as they pass out of it. At other times, and more frequently, they never burst at all, but are found deeply imbedded in the glandular structure of the kidney, when the body is examined after death. In a few instances an abscess connected with calculi of the kidney makes its way backwards, presenting itself,

and bursting in the loins. Some of you will remember a case of this kind which occurred in this hospital not long since. A woman died laboring under an abscess in one loin. On examining the body after death, the abscess was traced to the kidney of the same side, manifestly having had its origin in a large collection of irregularly-shaped calculi. In the Memoirs of the French Academy of Surgery, you will find a paper, in which the author describes two cases of renal abscesses which had burst in the loins, in each of which he succeeded in extracting some calculi through the orifice of the abscess. In one of them, after the removal of the calculi, the abscess healed, and the cure was complete. In the other, a fistula remained ever afterwards; in all probability in consequence of some calculi being still lodged in the kidney, at the bottom of the abscess. Some of the old surgeons have spoken of an operation for the extraction of calculi from the kidneys. The proposal is absurd and dangerous, if made with a reference to ordinary cases of renal calculi, where no abscess exists. But nephrotomy (as it has been termed) is very practicable where nature, by the formation of an abscess, has pointed out the exact situation of the calculi, so that they may be felt by means of a probe.

The condition of the kidneys in the cases which I have just described is very similar to that of which I gave some account in the fifth Lecture, and it is marked by a similar train of symptoms. The symptoms vary in degree according to the extent of the local mischief, and the susceptibility of the constitution. Sometimes many years elapse before they assume any formidable character; and I have already given you the history of a case in which the patient had suffered from calculi impacted in the kidney during a period of at least ten years, and then died of another quite independent disease.

The treatment of renal calculi next demands our attention; but what I have to say on the subject may be comprised in a few words.

You will frequently be consulted by persons who are voiding a great number of lithic-acid calculi in succession. Those already formed cannot be dissolved. The best thing that can happen is that they should pass along the canal of the ureter into the bladder, and then out of the bladder by the urethra. But you may do much towards preventing new calculi being generated. The remedies to be employed are similar to those which I have already mentioned as applicable to cases in which the urine deposits the lithic-acid sand. Purgatives and alkalies may be administered, and alterative doses of colchicum where there is a disposition to gout. Attention to diet and mode of life are even of more importance than medicine. But it is needless for me so say more on the subject. I refer you to the observations which I made in the last Lecture.

As to the oxalate of lime, or mulberry calculus, we can do little, probably nothing, in the way of prevention. Fortunately this defect

in our art is of less importance, as the formation of this kind of calculus is much less likely to recur than that of the lithic acid calculus.

The existence of the phosphate of lime calculus in the kidney always indicates disease of that organ; probably an abscess in it. Such cases are little under the control of remedies. However, we cannot be wrong in exhibiting the mineral acids, and otherwise adopting the same treatment as where the triple phosphate or phosphate of lime is deposited by the urine in the bladder.

The passage of a renal calculus from the kidney to the bladder is a natural process, over which we have but little dominion. Where the pain is unusually intense, opium may be administered with advantage, but it must be given in large quantity. The patient may also use the warm bath, remaining in it an hour, or even longer. These remedies, however, only tend to the diminution of suffering. Probably drinking plentifully of diluting liquors may be useful, by causing such a rapid flow of urine as will assist in the propulsion of the calculus along the ureter. I have sometimes thought that the patient has derived benefit from the exhibition of an active purgative; for example, a dose of senna, with sulphate of magnesia and tincture of jalap. Dr. Prout recommends the application of ice to the loin, as affording some relief from the intense pain which the calculus in the ureter sometimes produces.

If there are symptoms which lead you to suspect that a stone is lodged in the kidney, it is of course desirable that it should, if possible, be made to pass into the ureter before it has attained such a size as to be incapable of being conveyed along that canal into the bladder. Horse exercise, especially hard trotting in such a case, generally produces bloody urine. This shows that the calculus is made to undergo some change of position, and whatever produces this effect is, of course, favorable to its escape from the kidney. It is reasonable to suppose, that medicines which occasion a more abundant flow of urine combined with diluting drinks, may also be useful under these circumstances. Where a calculus retained in the kidney produces considerable pain in the loins and neighboring parts, the patient will sometimes derive benefit from local blood-letting, by cupping, or by leeches. At other times, from the application of the belladonna plaster. You may also employ setons and issues in the loins. According to my experience, however, the last-mentioned remedies are seldom very useful, except in those cases in which disease in the kidneys, and especially abscess of the kidney, has taken place as a consequence of the lodgment of the calculus. That they are sometimes eminently useful, under these last-mentioned circumstances, I cannot doubt. I have at this moment a patient under my care, who occasionally voids small calculi from the kidney, laboring, at the same time, under pain in the region of the kidney, with a purulent deposit from the urine; and who has derived marked benefit from a large issue made with caustic, in the lain to which the pain is referred.

Those extreme cases, in which abscess of the kidney has no means of discharging its contents, and, in consequence, produces symptoms

of general depression of the system, with a weakened circulation, and languor of body, and listlessness of mind, are, I fear, but little under the dominion of our art. We must support the patient by stimulants and tonics, and by making as little demand upon his powers as possible; but, for the most part, we strive in vain against his destiny; and he sooner or later falls a victim to his malady.

Hitherto I have spoken of calculi as being either lodged in the kidney, or as passing from thence to the bladder. But a calculus may be of such a size as to be stopped in its passage to the bladder, and retained in the ureter. One might suppose, that, under these circumstances, the ureter would become more and more dilated, and, at last, burst, as the urethra bursts behind a stricture. I cannot say that this never happens; and indeed Morgagni quotes a case from another writer, in which there is reason to believe that such an event actually occurred. However, this is not the constant order of events, as the following case will prove:—I attended it many years ago with Mr. Merriman of Kensington; and Mr. Merriman, jun. has lately sent me some notes respecting it. A gentleman, sixty-four years of age, who had been subject to the formation of renal calculi, which had afterwards come away by the urethra, was seized with one of his usual attacks, indicating that a calculus had escaped from the kidney. Instead, however, of terminating in the usual manner, the pain continued unaltered, and he ceased to void his urine. On the supposition that there might be urine in the bladder, the catheter was introduced several times, but no urine flowed. The patient became comatose, and died in a fit of convulsions, eleven or twelve days after the commencement of the attack. On examining the body after death, no urine was found in the bladder. In one kidney there were several calculi: there were none in the other. In the ureter belonging to the latter, and in the upper part of that canal, there was a calculus, as it were, impacted, of about the the size of a horse-bean. It appeared, therefore, that the circumstance of one ureter being completely obstructed by a calculus had caused a suppression of the secretion of urine in both kidneys.

A case still more remarkable occurred under the observation of my friend Mr. Travers. A patient died, having each ureter, where it arises from the pelvis of the kidney, completely obstructed by a calculus. The consequence of this double obstruction had been the same with that of the single obstruction in the case last mentioned—namely, an entire suppression of the secretion of urine.

A renal calculus, which is small enough to make its way down the ureter into the bladder, is, in the great majority of cases, also small enough to enter the inner orifice of the urethra, being then expelled by the action of the bladder and the pressure of the urine behind. In some instances it meets with an obstruction to its passage along the urethra. The most usual seat of such obstruction is immediately behind the glans, where, in some individuals, there is a natural narrowness of

the urethra. When lodged in this situation it may usually be removed with the assistance of a small forceps, or, if necessary, the narrow part may be dilated by means of a straight bistoury. In some cases of stricture of the urethra a small calculus has been found impacted behind the stricture, causing a retention of urine. In other cases, a calculus, having arrived at the membranous part of the urethra, has been prevented passing further, although there was no stricture, perhaps from the position of it being somewhat changed from what it was when it first escaped from the bladder. Under those circumstances the safest mode of proceeding will be to make an incision into the urethra, by which the calculus may be extracted. I had a case under my care in which two calculi had been lodged in the membranous part of the urethra for two or three years, the urine flowing over them. At last they produced a complete retention of urine, and this not being relieved, the urethra gave way behind the obstruction; and when the patient was admitted into the hospital the perineum and scrotum were completely infiltrated with urine, and gangrenous to a great extent. I made an incision in the perineum, and removed two calculi, one of them as large as a walnut. Unfortunately, the patient had too long delayed to apply for assistance; destruction of the soft parts had taken place to a great extent, and the case terminated unfavourably.

LECTURE XI.

History and Symptoms of Calculi of the Bladder.

Any solid body which is retained in the bladder for a certain time is liable to have calculous matter deposited on it. Thus a calculus is generated, which increases in size more or less rapidly according to the composition of the urine.

The most common origin of calculus of the bladder is a calculus which has been formed in the kidney which has descended by the ureter, and which is either too large to be voided by the urethra, or which is prevented entering the urethra by the projection of an enlarged prostate gland.

In some instances the nucleus is formed by a foreign body, which has been accidentally introduced into the bladder. The late Mr. Wilson removed a stone from the bladder of a female, and, on sawing it through, discovered a common hazel-nut in its centre. Mr. Wilson gave a portion of the stone, with the corresponding portion of the nucleus, to the late Mr. Heaviside, at the sale of whose museum I purchased it, with the rest of his collection of calculi; and thus you have the opportunity of seeing this singular specimen. A poor man, a gardener in the country, labored under a stricture of the urethra.

Occasionally he suffered from a retention of urine. Being an ingenious fellow, he discovered that he could relieve himself on these emergencies by introducing a flower-stalk through the urethra, into the bladder, using it as a bougie. In an evil hour it happened that the extremity of the flower-stalk was broken off, and lodged in the bladder. The consequence was, that it became encrusted with calculous matter, forming the nucleus of a stone. Some time afterwards, he was admitted into our hospital. Sir Everard Home performed on him the operation of lithotomy. He extracted a considerable oblong calculus, which lay partly in the urethra and partly in the bladder ; and, on examining it, the flower-stalk was discovered in its centre.—I removed a calculus from a patient in this hospital which had been formed round a portion of an elastic gum catheter that had been broken off in the bladder. A thoughtless young man introduced a piece of wax into his urethra, and continued to pass it up into the bladder. Ten years afterwards I performed on him the operation of lithotomy, and removed a calculus which is preserved in the museum of this hospital, having the piece of wax for a nucleus. I assisted Mr. Keate in an operation in which he removed a cylindrical piece of sealing-wax, several inches long, from the bladder. This was done soon after the sealing-wax had been introduced. If the operation had been deferred for some time, of course the sealing-wax would have become encrusted with calculous matter.

In one of the preparations in our museum you may see several calculi of a peculiar oblong figure, and of various sizes; the largest about three quarters of an inch in length, and one third of an inch in breadth; but the greater number of them very much shorter and proportionally narrower; each of which has a small fine hair running longitudinally through its centre. I extracted these calculi from the bladder of a female, and they are composed chiefly of the phosphate of lime; which circumstance, as I shall explain hereafter, indicates disease of the mucous membrane. It is difficult to say how it happened that these hairs existed in the bladder; whether they were common hairs, introduced accidentally, or whether they were some of those hairs which are found occasionally in encysted tumors, and in other diseased structures. I suspect them to be of the latter origin. I attended a gentleman who laboured under stone in the bladder, and also under a disease in the kidneys, of which last disease he died; and in whose urine I every now and then detected small hairs, which I had reason to believe had come from the bladder. Unfortunately, there was no *post-mortem* examination, either in this case or in that of the patient from whom these calculi were taken; but it is well known that it is not very uncommon for hairs to grow from the inner surface of an encysted tumor.

Calculi of the bladder differ very much in their appearance and other sensible properties; they differ very much also in their chemical composition. Of late years they have been made the subject of repeated and minute analysis. These investigations, so important to

human nature, and so interesting to the members of our profession, were begun by the late Dr. Wollaston. He was followed by several other chemists; but those who, after him, have contributed most to the advancement of our knowledge of the subject, are Mr. Brande, Dr. Marcet, Dr. Prout, Dr. Henry, and Dr. Yellowly. I shall present you with a brief summary of the observations which these distinguished chemists have offered to the world as the result of their researches.

The substances which enter into the composition of calculi of the bladder are the following:—

1. Lithic acid. These calculi are generally of an oval form, and slightly flattened; of a brownish-red color, approaching to that of mahogany; rather smooth on the surface, but not polished, except occasionally from friction, when there are two or more calculi in the same bladder. If broken, the lithic acid calculi split into concentric laminæ.

2. Oxalate of lime. Calculi of this kind are also distinguished by the appellation of *mulberry*. These are of a dark-brown color, approaching to black; rough and tuberculated on the surface, very hard, and imperfectly laminated.

3. The triple phosphate of ammonia and magnesia. This salt forms a fragile calculus, and when broken it does not, like the lithic-acid calculus, split into concentric laminæ. The surface of it is uneven, covered with minute crystals.

4. Phosphate of lime. Calculi composed of this substance, unmixed with other calculous matter, are rarely found in the bladder; and when they are, there is reason to suspect, from Dr. Prout's observations, that they have their origin in the secretions of the bladder itself, and not in the urine. These calculi are of a pale-brown color, and of a laminated structure.

5. Although it is rarely that we find a bladder-calculus composed altogether of phosphate of lime, we frequently find this salt existing in combination with the triple phosphate of ammonia and magnesia. This mixed calculus is of a white color; friable; not unlike a mass of chalk in appearance; not in general laminated. It melts into a vitreous substance when exposed to heat in the flame of a blowpipe; and hence it has received the name of the fusible calculus. Neither of the two salts, of which it is composed, (that is, neither the triple phosphate, nor the phosphate of lime,) melt in this manner when exposed to heat singly, although they are so easily fused when in combination with each other.

6. Lithate of ammonia. This variety of calculus is of a clay color; sometimes it is smooth, and at other times tuberculated on its surface: it is composed of concentric layers. Dr. Prout regards it as being almost peculiar to children.

7. Lithate of soda. This is a rare calculus, of white color, like the chalk-stones of gout, probably formed where the patient, having a lithic-acid diathesis, takes large quantities of soda. I was first informed of the existence of this kind of calculus by Dr. Prout. In our

collection of calculi you will see a fine specimen of it, with a deposit of pure lithic acid on its surface: probably there is a nucleus of pure lithic acid also.

8. Cystic oxide. This is a very rare kind of calculus: it is of a white color; and, when broken, it is found (to use Dr. Prout's own words) not to be laminated, but appearing as one mass, confusedly crystalized throughout its substance.

9. Calculi are sometimes composed of carbonate of lime, but these are of very rare occurrence indeed: the carbonate of lime, however, is frequently blended in small quantity with other ingredients.

10. Dr. Marcet has also described a variety of calculus under the name of xanthic oxide; and another under that of the fibrinous calculus.

11. The fibrinous calculus appears to be composed of fibrine of the blood. I have never met with but one example of it. This was of an oval shape, about the size of a horse-bean, yellow, semi-transparent, not very unlike amber in appearance, but less hard. When dried, it shrunk to a small size, and became, as it were, shrivelled. I found it in the bladder after death, where no disease of the urinary organs had been suspected during life, but where the kidneys were found to have been diseased when the body was examined after death. There can be little doubt that the kidneys had secreted albumen with the urine; and if we consider how near fibrine and albumen are to each other in their chemical composition, we cannot but suspect the fibrinous calculus to be a deposition from albuminous urine. Unfortunately, in this instance, the chemical properties of the urine had not been examined.

In some cases we find a calculus composed throughout of one of the substances, which have been described, nearly pure; but at other times we find these substances variously combined with each other. The best mode of examining a calculus is to have it sawn through the centre. We then find, that, in some of the compound calculi, the different substances are disposed in layers, the lithic acid distinct from the oxalate of lime; the oxalate of lime distinct from the triple phosphate, and so on; while in others they are intimately blended together.

It is only when they are divided in the manner which I have mentioned that we can learn the true history of the formation of calculi. As Mr. Brande long ago observed, the centre or nucleus is generally either lithic acid or oxalate of lime. In many cases, the additions to the calculus are of the same chemical composition with the nucleus; in other cases, we find the lithic acid deposited on the outside of the oxalate of lime; and more rarely, the oxalate of lime is deposited on the surface of the lithic acid. The deposite of acid, or oxalate of lime, may take place in the bladder, where there is no evident disturbance of the general health. If the general health becomes affected, and the bodily powers of the patient are impaired, either from the irritation of the stone in the bladder, or from any other cause, the urine becomes alkaline, and in consequence, the subsequent additions to the

calculus are formed of the triple phosphate of ammonia and magnesia. When the calculus has existed for some time in the bladder, it frequently happens, and indeed it always happens sooner or later, that the mucous membrane becomes inflamed; and an adhesive, tenacious mucus is secreted, which contains phosphate of lime; and this, being blended with the triple phosphate, constitutes the fusible calculus. Calculi formed in the ducts of the prostate gland, as I shall explain hereafter, are composed of phosphate of lime, pure, or nearly so. But whatever may be the condition of the bladder, it is a very rare occurrence to find a simple phosphate of lime calculus in it. In cases of chronic inflammation of the bladder, the phosphate of lime is deposited by the mucus in small masses, but these nuclei being exposed to the contact of the urine, and the health becoming impaired, as always is the case under these circumstances, the triple phosphate is added to the phosphate of lime, so as to constitute the fusible calculus.

For these latter observations I am indebted to Dr. Prout. He has also furnished us with a knowledge of the following most important and interesting facts in the history of calculous formations. There are but few cases in which the phosphates form the nucleus of a calculus; but being once deposited, they continue to be so, and are not followed by other depositions. The phosphates may succeed the lithic acid, or the oxalate of lime; but neither of these ever succeed the phosphates. If the external surface of a calculus is composed either of the lithic acid, or of the oxalate of lime, you may be certain that there are no phosphates in the interior; whereas, if there are the phosphates on the outside, the general rule, to which there are but few exceptions, is, that some other substance lies underneath. When a vesical calculus is sawn into two equal parts, the nucleus is seen in the centre, the calculous matter being deposited equally, or at least symmetrically, on every side. There are, however, exceptions to this rule, and occasionally we see the nucleus near one surface of the calculus, at a considerable distance from the centre. Mr. Cross has explained how this happens. The patient being confined to the recumbent posture, the calculus does not change its place in the bladder, and the fresh deposits take place only on the exposed surface.*

Calculous disorders prevail differently in different classes of society, among individuals of different ages, and in different climates and districts.

Among the lower classes, children are much more liable to calculi than adult persons. You know how large proportion of hospital patients admitted for lithotomy are children. On the other hand, in private practice, that is, among the upper classes of society, very few of our patients are children, and the great majority are persons above fifty years of age. Nor are these things of difficult explanation. In most instances, the original calculus is composed of lithic acid, that is, there is a lithic acid nucleus; and in a former Lecture I pointed

* Cross on Urinary Calculi, p. 13.

out some circumstances which are likely to make the children of the lower classes, and those who are advanced in life among the higher classes, especially liable to this kind of deposit.

In all classes, persons of a middle age are less frequently affected by stone in the bladder than those who are younger or older.

Patients with enlarged prostate gland are particularly liable to suffer from calculi of the bladder. The tumor of the enlarged prostate usually prevents the bladder being emptied without the aid of the catheter. The consequence is, that if a small calculus from the kidney finds its way into the bladder, it cannot escape in the usual manner by the urethra; and that it lies and grows in the bladder. For the same reason, lithic-acid sand, particles of phosphate of lime, or any thing else which can act as a nucleus, becomes, under these circumstances, the foundation of a stone in the bladder. The bladder is like a chamber-pot that is never washed out, and the component parts of the urine are very liable to be deposited in it, whenever there is any kind of nucleus to which they can adhere. Sometimes a diseased prostate gland causes the formation of calculi in the following manner:— The mucous membrane of the bladder becomes inflamed, as a secondary disease. The mucus secreted by it deposits the phosphate of lime in small mortar-like masses, and each of these becomes the nucleus of a calculus. In these cases, if you examine the body after death, you find probably a great number of calculi of irregular forms, of a white color, rough on the surface; none of them being of a large size.

But these irregularly-shaped calculi are capable of being united with each other, so as to form a single calculus of large dimensions, and of a regular figure. There is a fine specimen of this rare species of calculus in our museum. In the centre there is a congeries of small masses of calculous matter, with interstices between them, which appeared as if they had been originally cemented by mucus. On the outside of these is a shell or crust, formed of the mixed phosphates, regularly disposed in concentric layers. The history of the patient, from whom this calculus was taken, is highly instructive. He consulted me several years ago concerning an enlargement of his prostate gland, which prevented his emptying the bladder by his own efforts. At that time there was no stone, nor any disposition to form one. I instructed him in the use of the catheter, which he introduced two or three times daily, for three or four years, during the whole of which time he suffered comparatively little from his complaint. I always warned him never to leave off the regular introduction of the catheter; telling him, that whenever he did so, besides encountering other evils, he would make himself liable to the formation of stone in his bladder. At last, in an evil hour, he forgot my admonitions and listened to some other advice which was given him, that he should lay aside his catheter. At the end of a year from this time I was again called to see him. The urine was now depositing the usual adhesive mucus; and it was evident, from the small masses of the phosphates which it contained, that he was threatened with a stone in the blad-

der. I made him return to the use of the catheter: but it was too late. The stone went on increasing in size, until it became such as you now find it to be. It was at last extracted by an operation, from the first effects of which the patient seemed to recover; but he died soon afterwards, manifestly in consequence of disease in the bladder and kidneys; the operation having accelerated, without having actually occasioned, his death.

Women suffer less frequently from stone in the bladder than men. Their more temperate mode of life accounts, in part at least, for the difference. Much, however, is to be attributed to the more simple construction and greater diameter of the urethra, in consequence of which stones are voided by them, which would inevitably have been retained in the bladder of the other sex.

Mr. Copland Hutchison has published some observations, which are intended to show that calculus of the bladder is very rare among seafaring persons; much more so than in other classes of society: and hence he is led to conclude, that there is something in the peculiar life of a sailor, which is unfavorable to the production of this disease. However, if you bear in mind what I have just now stated, as to the greater prevalence of the disease among children, and among those who are advanced in life, and recollect also that among sailors there are no children, and very few old men, you will, I conceive, find a sufficient explanation of the fact in question, without resorting to Mr. Hutchison's explanation of it. Besides, it must be very difficult to obtain data sufficiently accurate to enable us to form any positive opinion on such a subject. I have myself operated on two officers in the navy, who were affected with stone in the bladder, and in whom the symptoms of the disease began while they were engaged in active service; and I conceive that these are quite as many cases as were likely to occur in my practice, even supposing the disease were as common in the navy as it is among landsmen. As to the proportion of common sailors who are admitted into the hospital laboring under stone in the bladder, we have no records enabling us to say any thing on this subject.

It is observed that calculi of the bladder prevail particularly in certain districts, while in some other districts the disease is extremely rare. I have a patient who resides sometimes near Norwich, and at other times near Bristol; and who, at the former place of his residence observes the urine to deposit lithic acid sand, which it never deposits while he is at the latter. This may be attributable perhaps, in part, to peculiar diet and mode of life. Dr. Prout believes, that hard or impure waters tend to the production of calculi. These explanations, however, are not altogether satisfactory. In some districts in which the disease is unusually prevalent, we find, if I am not much mistaken, that there are not only more calculi with a lithic-acid nucleus, but also more with a nucleus of oxalate of lime, than in other parts of the country; and it is difficult to understand how the agency of the same cause should produce, in different individuals, calculi of such different chemical composition, and depending on such different states of sys-

tem. Mr. Cross attributes the greater number of cases of urinary calculi which are met with in Norfolk and Suffolk to the influence of the cold northeast winds which prevail in these counties over the functions of the skin. But if this were the case, there ought to be a larger proportion of bronchial and pulmonary affections in Norfolk and Suffolk also, and I am not aware that this is the case. Besides although the checking of the perspiration may increase the disposition to form lithic acid, I know of no reason to believe that it would increase that to form the oxalate of lime.

A calculus for the most part lies loose in the bladder, being capable of moving, according to the laws of gravity, from one part to the other of the cavity in which it is placed. It is only in a few cases that it is otherwise. Here is a specimen of encysted calculi. The original disease, as you may perceive, was an enlarged prostate gland which prevented the patient from emptying the bladder. I conclude that the catheter was not used, as it ought to have been, for the purpose of emptying the bladder artificially. The consequence has been that the patient was continually straining to make water, and that the mucous membrane, by the pressure of the urine, has been caused to protrude in the interstices between some of the muscular fibres, forming small cells or cysts. Some small calculi, which escaped from the kidney, have found their way into these cysts, and have become lodged or impacted in them.

In the preparation which I now show you, there is a cyst of another kind. The case is in many respects remarkable. I discovered a stone in this gentleman's bladder. But he was advanced in years; and as for the most part he suffered very little inconvenience from the disease; he did not wish to go through any dangerous operation for the sake of obtaining relief; nor did I think it right, considering all the circumstances, to urge him to submit to it. He went on, in general suffering, little or nothing. He was a convivial man, dining a great deal in society, as if he had no ailment. Every now then, however, he was suddenly seized with the usual symptoms of stone in the bladder, and very severe ones too. He then sent to me: I kept him in the horizontal posture, prescribed him an opiate clyster, and in the course of a few days, sometimes sooner, sometimes later, the attack subsided; he was again at his ease, and enabled to return to his usual habits. I had been occasionally in attendance on him for three or four years, when he was seized with a severe cold, which ended in a pleurisy, of which he died. On examining the body, I found the stone imbedded in a cyst near the fundus of the bladder. The cyst was formed in this case, not by the protrusion of the mucus membrane between the muscular fibres, but by a dilation of both tunics of the bladder, the muscular as well as the mucous. It was such a receptacle as you would suppose a large calculus, which had long been resident in the bladder, might gradually have made for itself. If you look at the preparation, you will see that the stone was not so closely embraced by the cyst as to prevent it occasionally slipping out of it; and I suspect that this actually happened, and that it was when the

stone lay in the cyst that the patient was free from the usual symptoms of calculus, and that his sufferings took place when the stone escaped from it into the general cavity of the bladder.

You will hear not unfrequently of calculi which adhere to the bladder; but you may be assured, nevertheless, that this is a very unfrequent occurrence. Ask all experienced surgeons, and they will tell you now, that adhering calculi are rare. It is not very uncommon to find a diseased bladder, a portion of which is incrusted with calculous matter; but that is a very different thing from an adhering calculus, and not likely to be mistaken for a stone in the bladder. It occasionally happens that coagulated lymph is effused from the inflamed mucous membrane of the bladder. The inflamed mucous membrane also secretes that adhesive mucus which contains the phosphate of lime, as I explained to you formerly. A portion of the phosphate of lime thus produced, mixed probably with some of the triple phosphate from the urine, is deposited on the lymph, and thus the incrustation takes place. It corresponds exactly to the incrustation of the wound of the perineum which occurs after lithotomy, where the operation is followed by the secretion of the same ropy mucus from the bladder.

In many instances you find only a single stone in the bladder; in others there are two or three stones. In the latter case they are more or less polished on the surface, from rubbing against each other. Occasionally there is a still greater number of stones in the same bladder,—ten or twenty, or even thirty or forty. The greater the number of stones, the greater the quantity of friction; and you will see in some of the specimens in the museum how calculi, under these circumstances, are rubbed into the form of irregular polyhedrons.

We have next to consider the symptoms produced by calculi in the male bladder.

The first thing, that will strike you, when you come to study the disease in the living person, is, the different degrees of suffering to which different individuals, and even the same individuals, are subject, in different stages of this complaint.

The symptoms differ; 1st, According to the size of the stone, the smoothness and roughness of its surface, and its general figure:

2dly, According to the quality of the urine. Thus, the urine may be unusually acid, or it may be alkaline, and depositing the triple phosphate; and in either case it will be too stimulating for the parts with which it comes in contact, and the symptoms produced by the stone will be thereby aggravated:

3dly, According to the state of the bladder. Nothing aggravates the smptoms so much as the existence of inflammation of the mucous membrane. This increases the sensibility of the bladder a hundred-fold, and causes a small stone to produce a much greater quantity of distress and pain than a large one produces under ordinary circumstances.

If the bladder be healthy, a very small stone produces very trifling, and, indeed, very equivocal symptoms. The patient has the inclination to make water, induced by a rather smaller quantity of urine in

the bladder than under ordinary circumstances. He has a sense of irritation, scarcely amounting to pain, referred to the neck of the bladder, to the urethra, perhaps to the perineum, after the bladder is empty. In one instance, for many months the patient complained of nothing except an ocasional pain, and that but trifling, on the inside of one groin, and of the urine being tinged with blood, after riding on horseback. Bloody urine, after any jolting exercise, is a strong indication of a calculus somewhere, either in the bladder or kidney. Where it arises from other causes once, it arises from this cause twenty times. But this symptom is often wanting in the early stage of the disease, while the stone is still small, especially where the patient leads (as often happens) an inactive life. A small stone occasionally falls on the inner orifice of the urethra, while the patient is making water, and thus suddenly impedes or stops the flow of urine. This is one of the most characteristic symptoms of the disease in its origin; but even this is often either wanting, or not observed for a long time.

As the disease advances, and the stone grows larger, other and more decided symptoms show themselves; which may be thus enumerated:—

1. A very frequent desire to make water; the impulse to do so being sudden and irresistable, and liable to be induced by the smallest change of position.

2. Pain referred to a particular point in the glans penis, at the extremity of the urethra; the pain sometimes being described as a severe yet dull pain; at other times compared to the effect of a hot iron applied to the part—that is, what is called a burning pain. This pain is most severe after making water, and on taking exercise, when the stone falls suddenly down on the neck of the bladder.

This pain in the glans penis is one of the most marked symptoms of the disease. A child who labors under stone in the bladder tells you of it not in words, but by his actions. He is always pulling the end of the penis, and pinching it with his fingers, even so as to cause the prepuce to become elongated. You often find his fingers having the cuticle soft and sodden (as if they had been soaked in hot water), from the urine which has been imbibed.

3. The urine is frequently stopped as it flows from the bladder, by the stone falling against the inner orifice of the urethra.

4. Where there is a calculus even of a moderate size in the bladder, it rarely happens that the urine retains its natural clearness and transparency. A slight cloud is perceptible in it as soon as it begins to cool, and a mucous deposit takes place afterwards.

The disease, in some instances, may exist for many years before any severe symptoms arise. A gentleman had suffered in some degree for upwards of ten years: but the symptoms were so very slight that they did not in the smallest degree interfere with his comfort and usual habits. At the end of that time, being in London, he consulted me respecting them; but he felt so little inconvenience, and the subject so little attracted his attention, that his doing so seemed to be

almost a matter of accident. I examined the bladder, and detected in it this enormous calculus, which I now show you. Some months afterwards, his symptoms became much aggravated. He now said that he could bear them no longer, and I removed the stone by the usual operation.

This case, however, is not in the common course of events. In general the symptoms are progressive, and reach their height, so that the patient becomes a very great sufferer, in the course of two or three years.

At first his general health is unaffected; but at last the health begins to suffer, the urine becomes alkaline, and the triple phosphate is deposited on the original stone. The growth of a stone composed of the phosphates is much more rapid than that of one composed of the lithic acid. But this is not the only cause of the aggravation of the symptoms which now takes place. The alkaline urine is more stimulating to the bladder than healthy urine, and this is one source of the patient's increased sufferings. Another reason is, that that state of the general health, which causes the alkaline urine to be secreted by the kidney, is attended with an increased or morbid sensibility of the nervous system generally.

As the disease advances, the continued irritation kept up by the stone induces inflammation of the mucous membrane of the bladder. There is now a still further augmentation of the patient's sufferings. The stone is rolling about in an inflamed bladder; and you know how the sensibility of every organ in the body is increased by inflammation. The existence of this state of things is indicated by greater pain, and by the desire to make water being almost constant; by the urine being voided offensive to the smell, soon becoming putrid and ammoniacal, and depositing the usual thick, tenacious mucus, streaked with blood. This mucus, as I have already explained to you, leads to the formation of the fusible calculus; and all that I have now stated will enable you to understand that different kinds of calculus are attended with different degrees of suffering. A patient with a simple lithic-acid calculus suffers less than one with a calculus composed externally of the triple phosphate; and the latter less than a patient with a fusible calculus. The oxalate of lime or mulberry calculus, on the whole, occasions more distress than the lithic-acid calculus; probably on account of the irregularities which so frequently exist on the surface of the former; but it occasions less distress than the calculi composed of the phosphates.

Patients with diseased and enlarged prostate do not, in general, suffer more from the stone in the bladder than other individuals. Indeed, I am inclined to believe that, on the whole, they suffer less; probably in consequence of the tumor of the prostate preventing the stone falling down on the neck of the bladder. I have, however, seen three cases, in each of which there was a stone in the bladder, complicated, not only with an enlarged but with an ulcerated prostate; and the sufferings of these patients were greater than I had ever before witnessed in persons laboring under the same, or, I might

almost say, under any other disease. In two of these cases, the surgeon, who was in attendance, indiscreetly (as I think) performed the operation of lithotomy. One of them died in about five minutes after the operation ; the other became immediately comatose, and died in a few hours. The third patient was admitted into our hospital, under the care of the late Mr. Ewbank. The symptoms were precisely similar to those which existed in the two other cases ; and Mr. Ewbank, on the result of these cases being stated, very properly determined not to perform an operation, although the man had come into the hospital for the purpose. The poor fellow died in two or three days afterwards; and, on examining the body after death, we found a large stone and an ulcerated prostate, as had been anticipated.

Calculus in the bladder induces frequently an irritable state of the urethra, and thus causes a spasmodic stricture. It induces also increased efforts of the bladder to expel the urine; and thus the muscular coat of the bladder, after a certain time, always becomes increased in thickness.

I have mentioned three cases of calculus in the bladder complicated with ulceration of the prostate gland. But in these cases there was also inflammation of the mucous membrane of the bladder, and, as far as I have seen, such inflammation is never absent where the patient falls a victim to this disease. A moderate degree of inflammation of the mucous membrane may exist for a great length of time without causing irretrievable mischief; and if the stone be extracted, the inflammation may subside, and the patient may recover perfectly. But if the chronic inflammation becomes aggravated, so as to assume the character of acute inflammation, or even to approach it, the situation of the patient becomes dangerous, and, in fact, almost desperate. The inflammation extends up the ureters to the kidneys, and these last-mentioned organs become diseased in the same manner as in other cases in which inflammation is communicated to them from the mucous membranes. The inflammation also in some instances extends, through the muscular tunic of the bladder, into the atmosphere of loose cellular membrane by which the bladder is surrounded, and putrid sloughing abscesses are formed in it. I need not enter into a particular history of what occurs where these complications exist. The symptoms of disease in the bladder, or disease in the kidneys, are superadded to those of calculus in the bladder; and it is sufficient for me to refer you to the observations which I made on these subjects in my Lectures on the diseases of the bladder and prostate gland.

In some cases, but these are very few in number, the bladder ulcerates, and the stone escapes from its cavity. The bladder exhibited in this preparation is seen to have been ulcerated at its fundus. There were several calculi, and one of them, as you will perceive, had stuck in the ulcerated opening, and lay half in, half out of, the bladder. A middle-aged man was admitted into this hospital, in the year 1810, who had labored under symptoms of stone in the bladder for the preceding ten years. He had also a fistula in perineo. Sir Everard Home proceeded to extract the stone by the usual operation.

When, however, he had introduced the gorget, he found the stone (of the size of a walnut) lying in its concave surface, and he removed it with his fingers. No other stone could be discovered. The patient died on the fourth day after the operation. On examining the body after death, the bladder was found to be very much contracted, so that it was scarcely capable of containing an ounce of fluid. That which had been its muscular coat had degenerated into a kind of ligamentous substance. The mucous membrane bore marks of having been in a state of inflammation: it was extensively ulcerated; and the ulcer communicated with an ulcerated cavity in the perineum, in which the stone was lying at the time of the operation. The *fistula in perineo* has an inner opening in the membranous portion of the urethra. It may be worth while to mention that, in this case, one kidney was reduced to a third of its natural size, and contained a considerable quantity of pus. The ureter on this side had its cavity entirely obliterated: it was nothing more than a ligamentous cord, extending from the kidney to the bladder.

A case came under my observation, in which the patient died in a very short time after the operation of lithotomy, and in which after death, a very large abscess was discovered in the pelvis, communicating with the bladder by an ulcerated opening near the the prostate gland. In another case, there was an abscess, which occupied nearly the whole pelvis, but having no communication with the bladder. Both of these cases occurred, many years ago, in our hospital, under the care of Sir Everard Home. I mention them, because the patients died so soon after the operation, that it was evident that the abscesses must have existed before it was performed; and that they were the consequence of the disease, and not of the operation. In another case, also, in which the patient died in our hospital, under the care of Mr. Babington, in consequence of a stone in the bladder, without having undergone the operation, a considerable abscess was discovered in the pelvis. I suspect that such an abscess is not an uncommon occurrence where the patient is allowed to linger and die of the disease.

There is a class of cases, which, being of rare occurrence, do not seem in the present state of our knowledge, to be of much practical importance, but which I am unwilling to leave altogether unnoticed, especially as they exhibit a phenomenon of some interest in pathology.

In the Transactions of the Royal Society of London for the year 1731 there is a letter from Dr. Lawrence Heister, giving the history of a patient who having, for a considerable time, laboured under the symptoms of stone in the bladder, began to void by the urethra what had all the appearance of portions of a large calculus, broken down into fragments of various shapes and sizes. The number of these

fragments at last amounted to more than two hundred, and now the discharge of the fragments ceased, the symptoms at the same time having subsided, and the patient being restored to perfect health.

In this instance the discharge of the fragments of the calculus was attributed to the use of certain mineral waters; but a case is recorded by Dr. Prout in which the same thing happened, without the use either of mineral waters or of any other kind of medicine; and Mr. Cross has furnished us with two other cases, the account of which I shall give in his own words:—"I lately obtained from a gentleman, after a ride on horseback, numerous fragments of calculi thus produced" (that is, by knocking against each other); "and in my cabinet there are twenty-two calculi, removed after death from a patient seventy years of age, which are of a very irregular shape, but admit of being so arranged as to form four regular and well-shaped calculi, each of the size of a pigeon's egg, which, with the appearance of the different surfaces, proves that the calculi had broken in the bladder, by knocking against each other under certain movements of the body. The incrusted state of the fractured surfaces proves that the calculi were broken some time before the death of the individual."

Many years ago I had the opportunity of seeing several calculi, which were evidently fragments of a larger calculus, and which had been voided with the urine by a young lady. I knew no other particulars of the case, nor how it terminated. Some years have also elapsed since Mr. Green and myself were consulted respecting a gentleman who had come to London from the country, with a great number of calculi, of a small size, in the bladder. The day after his arrival he voided several of these which had the appearance of having been recently broken, probably from the concussion of them one against the other during the journey. A third case came under my observation, which was more remarkable than either of the preceding, and not less fortunate in its result than the one recorded by Heister. A gentleman who had passed the middle period of life, consulted me concerning an affection of his bladder. I discovered in it what appeared to be a calculus, and not of very small dimensions. I advised him to submit to the operation of lithotomy. The patient, however, was a timid person, and could not make up his mind to follow my recommendation. Having heard of some mineral water which had the reputation of doing good in cases of this description, he went to reside near the spring, in order that he might give the remedy a trial. How long he drank the water, or whether what I am about to mention occurred while he was still drinking it, or not until after he had ceased to do so, I am not certain. Be that as it may, he began to void, with his urine broken pieces of calculi, of various shapes and sizes, but generally with one convex and one concave surface, and rough irregular edges, as if the various laminæ of which the calculi were composed had cracked, and then had become separated from each other. After some time, a great number of these fragments having come away, the discharge of them ceased, the patient being, at the same time, relieved from all the symptoms under which he had formerly labored.

He died (as I have been informed), some years afterwards, of another complaint.

I give you these facts without any comment. Future observations are required to enable us to give a satisfactory explanation of them. In the mean time we cannot doubt that the subject is well worthy the attention of pathologists.

LECTURE XII.

Calculi of the Bladder—continued.

Many of the observations which I have hitherto made are applicable to cases of calculi in the female, as well as to those of calculi in the male sex. Others are applicable to the disease in the male sex only, and something is still necessary to complete the history of it in the female.

In women, for reasons which I have already stated, the disease is comparatively rare. It is of course difficult for an individual to form an estimate of the number of cases which occur in women, as compared with those which occur in men; but judging from what I have seen in my own practice, I should say, that the proportion is as one to fifteen or twenty. In women the disease occasions a frequent desire to make water. There is pain, especially after making water, referred to the extremity of the urethra. The urine is tinged with blood after taking exercise, and it undergoes the changes which cause the deposition of the triple phosphate, and afterwards that of the phosphate of lime, such as I have described in speaking of the disease in the male sex.

I may avail myself of this opportunity of mentioning a remarkable case of calculus in the female bladder, which fell under my observation in the year 1840. Mr. North and myself were consulted respecting a young lady laboring under very aggravated symptoms of this disease. The existence of a calculus having been ascertained by the introduction of a sound, I proceeded to extract it by an operation. The membrane of the urethra was divided at the upper part, and the canal was afterwards dilated in the manner which I shall describe hereafter. On examining the bladder with the finger, previously to the introduction of the forceps, I ascertained that the calculus was adherent to the inner surface of the bladder, near the fundus. However, I seized it with the forceps, and with the application of a moderate degree of force I was enabled to extract it, though not without its being broken into several pieces. These fragments were found to consist chiefly of the mixed phosphates, but among them were a small portion of bone of an irregular figure, and two imperfectly formed human teeth. If you refer to the tenth volume of the Medico-Chi-

rurgical Transactions, you will find a case and dissections recorded by Dr. Phillips (at the time residing at Andover), which fully explains the nature of the case in question. The teeth and bone, the result of an original mal-formation, were attached to the mucous membrane of the bladder, and formed the nucleus on which the calculous matter had been deposited. A similar case occurred in the practice of Mr. Warner, and is described in the forty-ninth volume of the Philosophical Transactions.

I should add, that some rather severe symptoms followed the operation. The patient, however, ultimately recovered; and, as far I know, has suffered no inconvenience since.

Diagnosis of Calculus in the Male Bladder.

You must, of course, satisfy yourself, in the first instance, whether a calculus actually exists in the bladder. The symptoms, in general, are sufficient for this purpose; but you must not rely on the symptoms only. They will rarely mislead you, but they will sometimes. There *may* be a stone in the bladder, without the usual symptoms; and there *may* be many of the usual symptoms, without a stone in the bladder. In children, especially, the deposition of lithic acid sand by the urine will not unfrequently produce, not only pain in the glans, but bloody urine, and all the other symptoms of stone in the bladder. A boy, between four and five years of age, was brought to me who had a constant inclination to make water. He screamed with pain as the urine flowed: he was perpetually squeezing the extremity of the penis between his fingers, as if he referred the pain to that part; and the urine was deeply tinged with blood. I scarcely entertained a doubt that there was a stone in the bladder. I examined the bladder in the way which I shall explain to you presently, but no stone was discovered. I examined it again and again, but still there was no stone. I then inquired more particularly into the child's health in other respects; and the result was, that I was led to prescribe an occasional dose of calomel and rhubarb, with rhubarb and sal polychrest in the intervals; and under this simple plan of treatment all the symptoms disappeared in the course of a few weeks.

Before you venture to give a positive opinion as to the presence of a calculus in the bladder, you must examine the latter by means of an instrument introduced into it by the urethra. Thus the stone may be made cognizable to the senses, and you may know that it exists with as much certainty as if you actually saw it. We commonly employ, for this purpose, the instrument which I show you now, an iron sound, having a curve approaching to that of a catheter. The sound ought to be large enough nearly to fill the urethra, but not to stretch it. If it be too large, it is closely embraced by the urethra, and the free motion of it in the bladder, so necessary for detecting a calculus, is prevented. The handle of the sound should be flattened, smooth, and polished, in order that the fingers may be in contact with as many

points as possible. In general we introduce the sound while the patient is lying on his back; but sometimes we detect the stone more readily when the patient is in the erect posture. Where the stone is large, the sound strikes readily at once, whether there be, or be not urine in the bladder; but if the stone be small, it is often difficult to detect it unless the bladder contains a certain quanty of fluid.

You should be provided with sounds of different shapes and sizes; but that which I find it most convenient to use in the majority of cases in the adult is nearly eleven inches in length exclusive of the handle, about three sixteenths of an inch in diameter; the last three inches of it being bent so as to form nearly, but not exactly, part of a circle, the diameter of which is three inches and a half. It is best to draw off the urine first, and afterwards to inject through the catheter four or five ounces of tepid water into the bladder. The sound, such as I have described, being then introduced, the point of it is easily turned in any direction, so as to explore every part of the bladder. The exammination may thus be very completely made. Nevertheless, if the symptoms are well marked, it will be unwise of you to conclude that there is no calculus, because you do not detect it in the first instance. I have known the most practised surgeons, with the most delicate sense of touch possible, use the sound several times, where the calculus was of a small size, before they felt it so distinctly as to be satisfied of its existence.

In some cases, a calculus which has not been discovered by means of the sound is at once detected by means of the elastic gum catheter. This is an observation made by Sir Everard Home, the correctness of which I have had frequent opportunities of verifying. The gum catheter should be introduced without the iron stilet, while the patient is standing, with his bladder full of urine. You allow the urine to flow through the catheter; and as the last portion of it comes away, the calculus falls down on the extremity of the instrument, in withdrawing which you feel it quite distinctly. Judging merely from the texture of the gum catheter, I never should have believed it capable of affording such certain evidence of a foreign body in the bladder as I know that it does from experience.

In some instances you may feel a calculus in the bladder with the finger introduced by the rectum. This method of examination is often useful in children, where the stone is above the middle size. It seldom affords you any assistance in the adult, except where the calculus is of extraordinary dimensions.

It is not sufficient that you should ascertain the existence of a calculus; it is of importance also that you should, if possible, learn something as to its size and composition.

You cannot, of course, actually measure or determine, accurately, the size of a calculus which lies concealed in the bladder; but, nevertheless, you may form some notion on the subject which will not be very far from the truth. If the symptoms show that the disease had existed only a shor time, and the urine has been, and is, of an acid quality, you may conclude that it is, in all probability, composed either

of lithic acid, or of oxalate of lime. Such calculi are not of rapid growth; and under these circumstances it is not probable that it can be of large dimensions. But if the urine has become alkaline, you will know that the last-deposited layers of the calculus are composed of the phosphates; and calculi of this last description are of more rapid growth, often attaining a considerable size in a moderate space of time. Whatever may be the composition of the calculus, if it has existed for a great number of years, it is to be expected that it will prove to be a large one. These considerations, however, carry you only to a certain point. You may obtain a more precise knowledge in the following manner:—Measure the calculus, by causing the convex part of the sound to traverse its upper surface from one extremity of it to the other.

When the bladder is full of urine, strike it with the sound, or with the end of the gum catheter. Observe what quantity of force is necessary to push it out of the situation in which it lies; and, accordingly, as it is displaced easily or with difficulty, so you may form an estimate of its weight and magnitude.

As connected with the diagnosis of calculi in the bladder it is right that I should caution you not to be misled by impostors, who pretend to labour under this disease, although they do not labor under it in reality. This is no uncommon species of deception. Some practise it for the purpose of exciting compassion, and obtaining money from charitable persons; others with a view to make themselves objects of attention and interest in their own families; and in not a few it can be referred to nothing but that perverted state of mind which so frequently accompanies hysterical affections. I saw some pieces of limestone which were actually extracted by means of the forceps, at various times, from the bladder of a female, who, having carved them of a suitable shape, had contrived to introduce them into that organ through the urethra. She was sufficiently skilful to impose for some time on a very well informed surgeon, as well as on many kind-hearted ladies, from whom she levied in consequence considerable pecuniary contributions. In another case several ounces of small pebbles and pieces of brick-bat were produced by a well-educated and accomplished young lady, living in ease and affluence, as having come from her bladder while in a water-closet. I am unwilling to multiply histories of this kind, degrading as they are to human nature. What I have already stated will answer the intended purpose. The mere appearance of the pretended calculi is in general sufficient to unravel the whole mystery. You may have recourse to chemical analysis if further evidence should be required.

Treatment of Calculi of the Male Bladder.

When a calculus passes from the kidney into the bladder, the diameter of which is less than that of the urethra, it is usually conveyed into that canal by the impulse of the stream of urine, and thus the patient is relieved of his disease. Sometimes, however, even a very

small calculus is prevented escaping in this manner, in consequence of an enlargement of the prostate gland forming a tumor projecting into the bladder, and making a kind of valve behind the orifice of the urethra. Many a person is liable to the descent of calculi from the kidney for many years, which are always passed with the urine, until he becomes somewhat advanced in life. Then the prostate becomes enlarged, and the calculi, which descend afterwards, are retained in the bladder.

Under these circumstances, it will be prudent for the patient to void his urine lying on his face, or leaning very much forward, so that what we call the anterior may become the depending part of the bladder. You will observe, that the valve made by the projecting tumor of the prostate is invariably on the posterior part of the bladder—that is, towards the rectum; and if the patient voids his urine in the posture which I have mentioned, the calculi are less likely to be interrupted by it than if he voids it in the usual manner. This, at least, is good in theory, and I may say that it is as good in practice also; for a patient of mine, an elderly gentleman, whom I advised to do what I have just mentioned, very soon became relieved of a small stone which had been for some time in the bladder.

A calculus which is of larger diameter than the urethra, of course cannot be voided by that canal. But you may dilate the urethra; and by doing so I have, in a great many instances, enabled the patient to void a calculus which had been for some weeks, or even for some months, in the bladder, and which he certainly could not have voided otherwise. The case here admits of little delay. Every day adds to the bulk of the calculus, and diminishes the chance of success. Introduce a bougie, or a metallic sound, of such a size as the urethra will admit without inflammation being induced. Every day, or every other day, according to circumstances, introduce one a little larger; and thus you may dilate the urethra gradually, until it is a good deal larger than its natural size. The degree of dilatation of which the urethra is capable varies in different cases; but it is generally considerable. When this process has been carried as far as it can be, let the patient drink plentifully of diluting drinks. It may be worth while even to give some of the compound spirit of juniper, or other diuretic, at the same time; and the calculus will probably, some time or other, be carried, by the current of urine, into the dilated urethra. You may add to the chance of the expulsion of the calculus, by adopting the following method:—Once daily introduce a large bougie into the urethra and bladder, and there let it remain. Then let the patient drink plentifully of barley-water, or toast and water, or weak tea, so that the bladder may become loaded with urine. When the patient can bear the distention of it no longer, let him place a vessel on a chair, standing and leaning forward over it. On the bougie being withdrawn, the urine will follow in a full stream, and the calculus may probably accompany it. I learned this mode of treatment from a patient who contrived it for himself, and who in this manner became relieved of three considerable calculi, for which an intelligent and ex-

perienced surgeon, in a provincial town, had recommended him to undergo the operation of lithotomy.

If a small calculus cannot be made to pass in the way that I have mentioned, you will probably succeed in extracting it from the bladder by means of the urethra forceps. Indeed, I may say, that you will never fail in doing so, unless the calculus is beyond a certain magnitude, or there is something in the condition of the bladder to prevent it from retaining a moderate quantity of urine; or unless there is a large tumor of the prostate projecting into the bladder, behind which the calculus may lodge, out of the reach of the instrument.

I cannot but regard this discovery of a method of extracting very small calculi from the bladder without the aid of cutting instruments as one of the greatest achievements of modern surgery. The credit of it belongs to an individual who has contributed in a variety of ways to the improvement of our art. I scarcely need tell you that I mean Sir Astley Cooper. But even he would not have succeeded in attaining the object which he had in view, if he had not been aided by the mechanical talents of Mr. Weiss; who, when the matter was explained to him, contrived the forceps which I now show you. Sir Astley Cooper has recorded his experience on the subject, in two papers published in the eleventh and twelfth volumes of the Medico-Chirurgical Transactions; and to these I may refer you, if you wish to become acquainted with the history of this invention, and of the cases to which it was first applied.

But it was not to be supposed that such a novel operation could be brought at once to a state of perfection. The forceps which Mr. Weiss originally constructed is liable to these objections. It is difficult to explore with it every part of the bladder; and in opening the blades, the neck of the bladder is always painfully dilated. The same thing may be observed respecting another forceps made on my suggestion afterwards. Mr. Weiss has since contrived a kind of forceps on another principle, and which is much better adapted for the intended purpose. A single inspection of it will make you better acquainted with its construction than the most labored description. You will observe that it is composed of two pieces of steel, one sliding longitudinally in a groove of the other. The extremity which enters the bladder is curved, but not in the manner of a common catheter; the curve being more abrupt, and the curved part considerably shorter. When the forceps is to be opened, the sliding piece is drawn towards the handle of the instrument; and thus the blades, in being separated, are still kept parallel to each other. They are closed by an opposite movement.

In using this forceps, you should select one of as large a size as the urethra will readily admit. If you have reason to believe that the calculus is of a very small size, or that there are several small ones, it is better that the opposite surfaces of the blades should be made concave; otherwise they may be nearly flat, and somewhat serrated. The patient should be laid on his back; and it is generally better that his pelvis should be supported by a thick cushion, so that it may be higher

than his shoulders. The first step of the operation is to introduce a silver catheter, and thus empty the bladder of its contents. From five to six ounces of tepid water are then to be injected into the bladder, so as to distend it moderately. If any considerable portion of the water should escape, the injection should be repeated, *it being absolutely necessary that the operation should never be attempted on an empty bladder.* The forceps is next to be introduced, and of course with the blades closed. It is first to be used as a sound, so as to ascertain the exact situation of the calculus. If this be not readily detected, the patient may be directed to turn on one side, placing himself on his back again afterwards; by which change of position the calculus may probably be made to roll into some more convenient place, within reach of the forceps. The blades of the forceps are then to be cautiously opened over the calculus, and afterwards closed upon it. By this simple management with a light hand, the calculus is seized with facility in many cases; otherwise you may adopt the following method, which rarely fails:—Let the forceps be opened with the convexity of its blades pressed against that part of the bladder which is towards the rectum, so as to make it the lowest or most depending situation. Then, by a slight motion given to the handle of the instrument, the calculus is made to roll into its grasp; and thus I have often been enabled to remove several small stones at once.

The advantages arising from the elevation of the pelvis is, that the calculus is then less liable to be lodged near the neck of the bladder, where the seizing it is always more difficult than when it lies near the fundus. Attention to this point is especially of importance in cases of enlarged prostate. Sometimes, however, when the calculus is very large, notwithstanding this precaution, it will remain in the hollow behind the prostate. You should make no attempt to seize it when it lies in this situation, but endeavor, by varying the position of the patient to make it roll into some other part of the bladder, or else defer the operation to some future opportunity.

When the calculus is grasped, you may know exactly its diameter by means of a scale fixed to the handle of the forceps. If it be of a very small size, you have only to withdraw the forceps from the bladder in the usual manner, and the stone with it. If it be of a very large size, so that it is evident that it cannot be made to enter the urethra, you need only to open the forceps again to set it at liberty; and you may then determine, at your leisure what other method should be adopted for the patient's relief. But the forceps may seize a calculus of an intermediate size; one which may be made to enter the urethra to a certain distance, being then stopped by some narrow portion of the canal. The neck of the bladder is very easily dilated, and a calculus of considerable size may be drawn into that portion of the canal which lies in the perineum. It may then be very distinctly felt through the integuments behind the scrotum, and if a small incision he made on it in this situation it is easily extracted, the forceps, after the removal of the stone, being closed, and withdrawn in the usual manner. I have performed this operation several times,

and have extracted calculi of more than an inch in one, and of nearly an inch in another, diameter. It is so simple, that, in two instances in which I had recourse to it, although I had no pair of hands to assist me but my own, it was not attended with the smallest difficulty. The patient should be directed to remain in bed afterwards, and an elastic gum catheter should be allowed to remain in the urethra and bladder, for the purpose of drawing off the urine, and preventing it dribbling through the wound. With this precaution, the wound will, in some instances, be enabled to heal in less than a fortnight.

But it will sometimes happen, that the calculus which is easily drawn through that part of the urethra which lies in the perineum meets with an impediment in the anterior part of the canal; that is, either at the external orifice, or exactly at the anterior part of the scrotum, or somewhere in the intermediate space. If the impediment be closed to the orifice, that part is easily dilated by means of a probe-pointed bistoury; and if it be in another part of the canal, you may remove it by means of an incision made through the skin, *corpus spongiosum*, and membrane of the urethra. *Let me caution you, however, never to make such an incision into the urethra immediately in front of the scrotum.* It is difficult, when you do so, even by the constant retention of an elastic gum catheter, to prevent a small quantity of urine finding its way into the loose cellular texture of the scrotum; and this may be productive of a succession of troublesome abscesses, or even of dangerous consequences. If a calculus seized by the forceps can be drawn so far forwards in the urethra, it may be always drawn somewhat further; or if the forceps be so constructed that the blades may be closed and compressed by means of a screw, it may be crushed while in the urethra, and thus removed in fragments. On the last mentioned subject, however, I must refer you to a future Lecture, in which I shall treat of the operations of lithotrity.

I have been thus particular in describing the use of the urethra forceps, because I am satisfied that there is nothing in surgery more deserving than this is of the attention of the student. If ever the period should arrive, at which surgeons generally have made themselves expert in the performance of this operation, and the public are made fully aware of the great importance of their making an early application for relief, the disease of stone in the bladder, now so terrible, will be regarded as a comparatively trifling ailment; and with a few exceptions, patients who labor under it will no longer feel that they have to choose between a miserable death from the disease, and the employment of a dangerous remedy.

Before I quit the subject, I ought to mention, that I have found this method of treatment applicable to cases which I was formerly accustomed to consider as being nearly hopeless. I have already explained to you in what manner, where the mucous membrane of the bladder is affected with a chronic inflammation, a multitude of small irregularly shaped calculi become collected in it, composed chiefly of phosphate of lime deposited by the adhesive mucus, which is secreted under these circumstances. Such cases are altogether unfit for any

serious operation; and the patients usually die after some months, or even one or two years, of lingering misery. In the summer of 1833, however, an elderly gentleman, laboring under this complication of disease, with the addition of an enlargement of the prostate gland, placed himself under my care. The urine was ammoniacal, filling the chamber with an offensive odor, and depositing a large quantity of adhesive mucus. The desire to make water was incessant, and the act of making it was attended with the greatest suffering. On the introduction of a sound, a large quantity of calculous matter was detected in the bladder. The patient was unable to empty the bladder by his own efforts; there being always a residuum of two or three ounces of urine left in it. In the treatment of the case, I began with drawing off the urine once daily, by means of an elastic gum catheter, washing out the bladder by an injection of tepid water afterwards. I then added a single minim of the concentrated nitric acid to each ounce of the water used for the injection. This local application was attended with excellent results. The mucous secretion became very much diminished in quantity; and the bladder at the same time so much less irritable, that four or five ounces, either of urine or warm water, could be retained in it without much inconvenience. I now proceeded to extract the calculi which it contained, by means of the urethra forceps. None of these were of a large size, but they were very numerous, so that several operations were required, occupying, with the necessary intervals, not less than four or five weeks. At last the whole of them were extracted. The chronic inflammation of the mucous membrane now completely subsided; but as the patient still was unable to empty his bladder, I recommended that he should use the catheter at regular intervals, always injecting some tepid water after he had drawn off his urine. The patient lived in a state of comfort for nearly a year, when, being, as I have already stated, an old man, he died of another complaint.

However useful the method of treatment which I have just described may be while the stone is still of small dimensions, it is evident that it can be of no avail in other cases. We must resort to other expedients, whenever the stone is of too large a size to be drawn easily through the neck of the bladder.

It has been observed by chemists, that lithic acid admits of being dissolved by a strong solution of pure or caustic alkali. It has been also observed that calculi composed of the phosphates are acted on by the mineral acids; and it may not unreasonably be entertained as a question, how far those changes, which take place out of the body, may be produced while the calculus is still in the bladder of a living person.

This problem, of the solution of calculi by chemical agents, has occupied the minds of many individuals both in past and present

times. It has been proposed by some to administer the menstruum by the mouth, so that it might be conveyed into the urine by the usual channels; and by others to inject it into the bladder, by means of a catheter. This subject is one of great interest, and well deserves our serious and unprejudiced consideration.

I fear that those who have expected by these methods to relieve patients of lithic-acid calculi, have much over-rated the effects of alkaline *lixivia* on them. The fact is, that although alkalies certainly are capable of acting on this kind of calculus, their action, except when employed in a very concentrated form, is so inconsiderable as to amount to almost nothing. Neither the stomach nor the bladder is capable of bearing the quantity of alkali which is necessary to the production of the desired effect; and even if they were, it would be impossible to maintain so constant a supply of the alkali as would be necessary to the destruction of a calculus of even moderate dimensions. Mr. Brande, moreover, has observed that the carbonates of potass and soda have no action on lithic acid; that they are incapable of dissolving it; and that, if the pure alkali be taken by the mouth, it never reaches the bladder in this state, but only in that of a carbonate: and here, then, is an insuperable objection to all attempts to dissolve lithic-acid calculi by means of alkalies taken into the stomach. When there is a lithic-acid calculus in the bladder, and the lithic-acid diathesis prevails in the system, the first effect of alkalies taken into the stomach is to render the urine neutral; thus preventing the further increase of the calculus. So far, then, alkalies are useful. But if they are administered in still larger quantity, so as to render the urine alkaline, the phosphates begin to be deposited. The calculus then continues to grow even more rapidly than before; but its composition is altered, and layers of the triple phosphate are deposited on the lithic-acid nucleus. Such is the view of the subject taken by Mr. Brande; and if you read what he has said on the subject in his papers on calculi, you will, if I am not much mistaken, be satisfied that it is well founded.

But you will, not improbably, hear of cases in which it has been supposed that, under the use of alkaline medicines, calculi have come away by the urethra, broken down into fragments; and you will hear of others in which, under the same mode of treatment, the symptoms dependent on the calculus have vanished; and this circumstance has in itself been regarded as a sufficient proof of the calculus having been dissolved, although no calculous matter had ever been discovered in the urine. But none of these cases will stand the test of critical inquiry. I have in a former Lecture referred to some remarkable cases, in which calculi seemed to have been actually broken into pieces in the bladder. But however it was that this happened, it is evident that it was to be attributed to the operation of mechanical causes, and not of chemical solution. In other cases the supposed fragments, instead of being parts of an old stone dissolved, have been actually a new formation—the mischievous result of the indiscreet and unscientific exhibition of alkaline medicines. Such cases, in-

stead of adding to the laurels of surgery, only show how this important and useful art may become a source of evil instead of good, when it falls into the hands of the inconsiderate or ignorant. With respect to the cases of the second order, you will observe, that, when you come to investigate them, you never find that the symptoms have altogether and completely subsided. There has been some diminution of them, but that is all; and various circumstances will explain whatever amendment has taken place. Thus a stone may become encysted, which was not so originally. So it was, probably, in a case, the history of which I related in a former Lecture. Another remarkable example of this occurrence presented itself to Sir Astley Cooper and myself. A gentleman, about sixty-six years of age, consulted us concerning a frequent desire to make water, attended with pain and other symptoms, such as a stone in the bladder might occasion. We had a suspicion that there was a stone in the bladder, and had purposed to examine the bladder with a sound. Previously to this being done, however, the symptoms began to subside, so that the patient suffered comparatively little inconvenience from them. About a year and a half afterwards he died of another, and wholly different disease. On examining the body after death, we found, at the fundus of the bladder, a cyst formed by the protrusion of the mucous membrane between the muscular fibres; and in this cyst was lodged a calculus of the size of a hazel-nut, of which it seemed impossible to doubt that it had been the cause of all the distress which the patient had suffered formerly. Now let us suppose that, in such a case as this, the existence of the calculus having been ascertained, the patient had gone through a course of alkaline medicines; would it not have been supposed by himself and his friends that the alkalies had produced a cure?—and if the real circumstances had not been disclosed by a *post-mortem* examination, would not the case have been handed down, as affording an example of the great influence of alkalies over calculous disorders?

Another circumstance may occasion a considerable abatement of the symptoms of stone in the bladder; namely, an enlargement of the prostate gland. The more urgent symptoms produced by a calculus arise from its coming in contact with the internal orifice of the urethra. But where the prostate is enlarged, so as to form a tumor projecting into the bladder, this is in great measure prevented. The calculus becomes lodged, as it were, in the hollow behind the tumor, and is thus prevented falling down on the neck of the bladder; and if the enlargement of the prostate supervenes on a stone in the bladder, the symptoms in the latter disease are likely to be, in no inconsiderable degree, relieved. Sir Everard Home has published an account of two cases, the circumstances of which are, as it would seem, to be explained in this manner. These cases are especially interesting on this account,—that both of them had been published while the patients were yet alive, in proof of the efficacy of solvents. In each of them, the stones, which were supposed to have been dissolved, were found in the bladder after death, apparently unaltered. I may mention as a

matter of curiosity, that one of these patients was Sir Everard's own father.

The mineral acids undoubtedly exercise a much greater chemical action on calculi composed of the phosphates, than alkalies do on those which are composed of lithic acid. It is not, indeed, possible to exhibit them by the mouth in such quantity as to render the urine sufficiently acid for the purposes of a solvent; but we have no right to conclude from thence that they may not produce this effect if injected into the bladder by the urethra.

I have already explained the use of injections of a weak solution of nitric acid, in relieving chronic inflammation of the mucous membrane of the bladder. In making further experiments on the subject, I found that where the mucous membrane was not inflamed at all, or inflamed only in a slight degree, the proportion of the nitric acid might be increased to two minims or two minims and a half of the concentrated acid to an ounce of distilled water, without any ill consequences, or even inconvenience, arising from it. I next endeavored to ascertain to what extent a solution of this strength was capable of acting on a calculus of the mixed phosphates. The change produced was sufficiently obvious, especially when the solution was made to pass over the calculus in a stream for a considerable time. It gradually diminished in size, and at last began to be broken down into minute fragments. About this time, an elderly gentleman consulted me under the following circumstances:—He had labored under stricture of the urethra for a great number of years. The stricture had been much neglected; and, at last, had produced the usual consequences—disease of the bladder—that is, chronic inflammation of its mucous membrane, and, probably, disease of the kidney also. The patient had an almost incessant desire to void his urine; every attempt to do so was attended with the most excruciating pain; the urine, at the same time, being highly alkaline, offensive to the smell, depositing a large quantity of viscid mucus, with which were blended small particles of phosphate of lime, resembling mortar. He was drinking lime-water, which some one had advised him to take, with great perseverance, and, the more he drank, the more he suffered, and the more mortar came away. This, he thought was all as it ought to be; and he expressed himself as patients often do under the same circumstances, saying that, no doubt, it was better that he should get rid of the gravel, and that the lime-water must be doing him good. However, not being so well satisfied on this point as my patient seemed to be, I advised him to leave off the lime-water. The symptoms were immediately altered for the better; but still they were bad enough. The next step was to introduce a catheter, and afterwards a sound, into the bladder. When this was accomplished, which, on account of the contracted state of the urethra, was at first not without some difficulty, I at once detected a calculus. Here, then, was a case of calculus manifestly composed of the phosphates, arising out of a diseased state of the bladder, and a case in which the danger of any kind of operation would have been so great, that no prudent surgeon would think him-

self justified in recommending it to the patient. Dr. Prout was consulted at my request, and he agreed with me in thinking, that, under the peculiar circumstances of the case, it was one well fitted for the experiment which I had proposed with the nitric acid injection.

For this purpose I procured the catheter which I now show you. It is made of the purest gold which can be worked. It has two channels, which are separated from each other by a longitudinal septum running the whole length of the instrument. Each channel terminates by a distinct tube at the handle, and has a separate eye, or opening, at the other end of the catheter. By means of this instrument, you will observe that a liquid may be injected into the bladder, entering it by one passage, and flowing out of it by the other, so that there may be a current through the bladder, without that organ being inconveniently distended. I had contrived a complicated apparatus for the purpose of making the injection ; but I was afterwards led to prefer the simpler contrivance of an elastic gum bottle, having a stopcock, and an elastic gum tube attached to it. At first I washed out the bladder with some distilled water, to get rid of the mucus which was lodged in it. Then I injected the solution of nitric acid very slowly, using the same liquid over and over again several times. After the operation was performed, the liquid which had been employed as an injection was tested by the addition of a *highly concentrated* solution of pure ammonia ; and it was always found, that, if the ammonia was added in a sufficient, but not too large a quantity, the phosphates were precipitated in abundance. The patient suffered no material inconvenience from this operation. It was continued sometimes for fifteen minutes, sometimes for half an hour, and repeated, according to circumstances, once in two, or three, or four days. At last, in making water, the patient voided these two small calculi, composed of the phosphate of lime, with a small proportion of the triple phosphate. It was impossible to doubt that they had been acted on, and partly dissolved, by the acid injection, and that they had at last, come away by the urethra, in consequence of their having been thus reduced in size. For some time after this occurred, the patient was in a state of comparative ease. He had still symptoms of stricture of the urethra and diseased bladder, but he was free from the more urgent symptoms under which he had labored formerly. By degrees, however, these symptoms began to recur ; and I have no doubt that there was a fresh formation of calculi, produced chiefly, as was the case with the former ones, by the diseased state of the bladder. If he had remained in London, I should probably have been able to have given him some further relief, by repeating and continuing the use of the injection. But he went into the country, where, having been for a long time in a very bad state of general health, he at last died, as I was informed, of some disease not immediately connected with that on account of which I had been consulted.

Since the occurrence of this case, I have, from time to time, as opportunities presented themselves, endeavored to follow up the investigation ; and I have contrived a more complete apparatus for the

purpose of making the injection. From the experiments which I have made, I feel justified in drawing the following conclusions :—

1. That a calculus, composed externally of the phosphates, may be acted on by this injection so as to become gradually reduced in size, while it is still in the bladder of a living person.

2. That there is reason to believe that small calculi, composed throughout of the mixed phosphates, such as are met with in some cases of diseased prostate gland and bladder, are capable of being entirely dissolved under this mode of treatment, and that it is probable that it may therefore be applied with advantage to some of these cases, in which, from the contracted state of the bladder, or from other circumstances, the extraction of such calculi by means of the urethra-forceps cannot be accomplished.

LECTURE XIII.

Operation of Lithotomy.

I PROCEED to describe the method of extracting a calculus by means of an incision of the bladder. This is what is commonly called the operation of lithotomy. I shall draw your attention to the operation on the male sex first, and afterwards to that on the female.

You may make an opening into the bladder at its fundus; and this is what is meant when we speak of the high operation. You may also make the opening at the neck of the bladder. The experience of the great majority of surgeons, from the time of lithotomy having been first practiced to the present day, is in favor of the latter method of operating; but as to the exact mode of making the incision at the neck of the bladder, there has been, and still is, a considerable variety of opinion. I shall explain to you what I am led to believe to be the most eligible method of performing the operation; endeavoring to establish, at the same time, the principles on which it is to be conducted; the observance of which will enable you to do all that human means can do towards the safety of your patient.

In order that the object of the operation may be clearly understood by those, who have not yet studied the subject, I am accustomed to explain it in the following manner:—

A small calculus may be voided by the urethra, without an operation of any kind. A larger calculus is prevented coming away, because the urethra is too small to receive it. The obvious remedy for this is to dilate the urethra, to make it wider; and if it cannot be sufficiently dilated by the bougie, it must be dilated by the knife. But it is unnecessary to divide the urethra for this purpose through its whole extent. It is much easier to cut down on the urethra where it lies in the perineum, and dilate the posterior portion of it (which includes

what is called the membranous part, and also that which lies imbedded in the prostate gland). The stone may then be extracted through the wound in the perineum, the greater part of the urethra remaining untouched and unhurt.

In performing this operation there are some things to be especially kept in view.

1st, The external incisions are to be made in such a manner as that there may be a sufficient space for the easy extraction of the calculus. Such a space does not exist between the two rami of the pubes, in the upper part of the perineum. Neither will it be obtained by an incision made in a vertical direction, in the line of the raphe of the perineum, unless, indeed, it be carried so low down as to divide the anus and a portion of the rectum. But if the incision be made obliquely, beginning at the raphe of the perineum, and extending laterally between the anus and the tuberosity of ischium, there will be room, as far as the external parts are concerned, for the extraction of a very large calculus. Such an incision will manifestly answer the intended purpose, at the same time that it is not liable to the objections which may be urged against the incision made in the course of the raphe, and extending into the rectum.

2dly, The incisions are to be made so as to avoid any considerable and dangerous hæmorrhage. It is idle to say that the occurrence of such a hæmorrhage is a hypothetical evil. Even in a young person, with a small mass of substance in the perineum, there are vessels which may bleed much if divided. But the operation is frequently performed on persons advanced in life who have a deep perineum, that is, in whom a large quantity of soft parts must be divided before the knife can reach the bladder. The vessels of the perineum are in them large in proportion; and an incision made with the utmost care will sometimes divide vessels which will bleed profusely. On this account, the incisions should not be more extensive than is really necessary; especially in the deep parts of the perineum, where the bleeding vessels are not so readily to be discovered, nor so easily commanded, as they are near the surface. With the same view, the incisions should be low down in the perineum, so that there may be as little risk as possible of wounding the artery of the bulb of the urethra; at the same time that care is taken not to carry them close to the ischium, where the trunk of the internal pudic artery is situated, and where its branches are, of course, of a larger size than at a greater distance from their origin.

3dly, It is, on other accounts, of great consequence, that there should be no large incision of the neck of the bladder. The prostate gland is of a firm, dense structure; and when it is divided, the urine passes over the cut surface, without there being any danger of its penetrating into its substance, or into the neighboring textures. But on the outside of the prostate, and neck of the bladder, is loose cellular membrane, which, if the urine has access to it, may become infiltrated with it to a very great extent; and which, thus infiltrated, is likely to be rendered the seat of extensive inflammation, sloughing,

and abscesses. It is important, therefore, that we should avoid carrying the incision beyond the boundaries of the prostate into this loose cellular membrane. It is true, that, if the stone, which is to be extracted, be beyond a certain magnitude, this cannot be avoided; but it may be avoided otherwise. Not only a small stone, but one considerably above the average size, may be taken out of the bladder, through a wound which does not extend beyond the limits which I have mentioned; and in many instances where, from the size of the stone, this cannot be accomplished by means of an incision confined to one side of the prostate, the object may be attained by making a double section, and dividing the prostate on both sides.

The dangers attendant on an extensive wound of the neck of the bladder, penetrating beyond the margin of the prostate, are not merely theoretical. As long ago as the year 1810, the case which I am about to mention first opened my eyes to the ill consequences arising from a communication being made between the cavity of the bladder and the loose cellular membrane in which it is enveloped. I was present at the operation of lithotomy, performed by a very experienced and skilful surgeon. There seemed to be no difficulty in its performance, and the forceps was introduced only once into the bladder; but the bladder (as I suppose) was in a contracted state, and the surgeon, in opening the forceps, observed a resistance, which suddenly gave way, as if a ligature had been broken. In the evening the patient was apparently well; but during the night he had no sleep, and he complained exceedingly of hunger. On the following day, towards the afternoon, his abdomen became a good deal distended, and the pulse rose to 150 in a minute. He was low and desponding; his hands were cold, and his respiration frequent. During the following night, (the second from the operation) these symptoms became aggravated. He had still no sleep; the pulse was more rapid and feeble; and on the following morning he died.

It fell to my lot to examine the body after death. In doing so I found that the mucous membrane and muscular tunic of the bladder had been ruptured for about the extent of three quarters of an inch. The rupture was situated on the left side, just anteriorly to the rectum, and it, of course, extended into the cellular membrane on the outside of the bladder. The cellular membrane in the neighborhood of the rupture, and for some distance upwards in the course of the ureter, had the appearance of being infiltrated with urine; it was inflamed and sloughy; and at the lower part, close to the bladder, its cells were occupied by a small quantity of pus.

In the year 1816, I met with the following case, which confirmed the suspicions which the preceding case had excited in my mind:— A little boy, about a year old, was admitted into the hospital, laboring under stone in the bladder. I performed the operation for its extraction, making the incision of the prostate with a common scalpel. Having introduced my finger into the bladder, I felt a very large stone, and at the same time found that I had made a very small incision. On this I introduced a probe-pointed bistoury, and dilated

the wound, as I thought, sufficiently for the easy extraction of the stone. On the following day the pulse was rapid: the patient was low and depressed; and from this time he continued to sink, until he died on the third day after the operation. On dissection, I found that the wound at the neck of the bladder had extended beyond the boundaries of the prostate gland. The cellular membrane in the neighborhood had all the appearance of having been infiltrated with urine. It was in part inflamed, and in part in a state of slough, being converted into a substance resembling wet tow. There was nothing else to account for the patient's death.

Some time after the occurrence of this last case, I had the opportunity of perusing Scarpa's Memoir on the Cutting Gorget, and was gratified to find that the views which I had been led to form corresponded to those of this distinguished surgeon. That these views are correct, I cannot at this moment entertain the smallest doubt. They are supported by other cases which have fallen under my observation, in which the patient manifestly died from inflammation and sloughing of the loose cellular membrane surrounding the prostate and neck of the bladder. If any one who has had much experience in lithotomy will look back at the cases which he has met with, in which patients have died after the operation, he will, if am not much mistaken, find that what I have just mentioned will explain many things which would be otherwise inexplicable; in particular, he will find an easy solution of the great danger which attends the extraction of very large calculi. He will also be enabled to comprehend wherefore it is that patients, on whom the operation is performed with the greatest apparent dexterity and ease, and in the shortest possible space of time, sometimes die in the course of two or three days after the operation; while others, in whom the stone appears to have been extracted with difficulty, recover without any unfavorable symptoms.

I proceed next to explain to you in detail the various steps of the operation. The first, as I have already stated, is the making an incision into the urethra, where it lies in the perineum; the second is the dilating, or dividing that canal where it is surrounded by the prostate. To facilitate the accomplishment of these objects, it is convenient to begin with introducing into the urethra this solid steel instrument, which we call a staff. It is of the figure of a sound; from which, however, it differs; first, in the handle, which, instead of being smooth and polished, is made rough, in order that it may be more firmly and steadily held; secondly, in having a groove, like that of a director, on its convex side. It is, in fact, a director, and intended to answer precisely the same purpose. The staffs sold by the instrument-makers are generally of too small a size. They should be as large as the urethra will easily admit without being painfully stretched. A large staff is more easily felt in the perineum than a small one, and it admits, of course, of a deeper and wider groove. The groove ought to become gradually shallower just before it terminates at the extremity of the instrument, in order that the point may be neatly rounded off. The edges of the groove ought to be carefully rounded

off also. Attention to these circumstances in the construction of the staff, renders its introduction more easy. I generally begin the operation with introducing the staff into the bladder, merely because it is, on the whole, more readily managed when the patient is standing erect, than after he is placed on the table.

The next thing is to secure the patient in a proper posture, with the perineum exposed. About two feet six inches is a convenient height for the table. The patient should be placed on it, lying on his back, supported by pillows, with his shoulders somewhat elevated. He should be directed to grasp the outside of each foot with the hand of the same side; and then the hand and foot are to be bound together by several turns of these bandages, which we call lithotomy garters. If the patient be corpulent, he probably will not be able to grasp his feet, and he must in that case grasp his ankles instead. Besides the lithotomy garters, it is convenient to apply another bandage—the neck strap,—which is thrown over the back of the neck, and passed under each ham. These bandages are not employed with a view to prevent the patient struggling, as persons out of the profession generally suppose, but solely for the purpose already mentioned, namely, to keep him in a convenient posture, with the perineum properly exposed. Thus prepared, the patient is drawn towards the end of the table, with the buttocks rather projecting over it.

Several assistants are required, one to support the patient on each side, holding his feet, hands, and knees, and keeping the lower limbs well asunder; a third to give you the instruments, in the order in which you want them; and a fourth to hold the handle of the staff. It is also convenient, though by no means necessary, to have another assistant, to support the patient's shoulders. Your assistant, who holds the staff, may stand on either side, but it is usual for him to stand on the patient's left side, in order that he may take the handle of the staff in his right hand.

The surgeon himself should be seated on a stool before the patient. He is first to attend to the position of the staff, taking care that it is held nearly perpendicularly; the handle of it being, however, a little inclined towards the patient's right groin. This causes the convexity of the instrument to project slightly on the left side of the perineum.

In the first part of the operation your attention is to be directed to the staff. You are to feel it with your left hand, and the knife, held in your right hand is to be directed towards it. It is a sure guide; following which you can never err, even in the deepest perineum. On the other hand, if you lose sight of it, you are cutting in the perineum as it were at random; you divide parts which you ought not to divide; especially you are in danger of carrying your incisions too near the ramus of the ischium, where the arterial branches of the internal pudic artery are of a larger size than in the centre of the perineum, and therefore more liable to bleed. I have seen some surgeons endeavor to introduce the point of the double-edged scalpel into the groove of the staff at the first incision. But I caution you against this, as a great error in the operation; except, indeed, it be in

the case of a young and very lean subject. Where there is any quantity of fat in the perineum, or any thing even distantly approaching to what we call a deep perineum, if you attempt to cut at once into the groove of the staff, the result is, that you open the urethra too far forwards; you divide the *corpus spongiosum* of the penis, which need not in reality be divided at all: and you are then certain of wounding the artery of the bulb of the urethra, which otherwise is, in most instances, avoided. Another inconvenience which attends on this method of proceeding is, that the wound being too near to the scrotum, the cellular membrane of it is in danger of being infiltrated with blood, and another still is, that a greater mass of substance is left to be divided, when you continue the incision into the bladder, than there would have been if you had cut into the urethra farther back in the first instance.

I say, then, let the opening in the urethra be made deep in the perineum, behind the bulb, and as near as can be to the prostate. Place the thumb of your left hand on the skin over the staff; and, in a man of ordinary size, about an inch and a quarter before the anus. Begin your incision immediately below this, on the left side of the raphe, and continue it backwards and towards the left side, into the space between the anus and the tuberosity of the left ischium. Here you may cut freely; you can injure nothing of consequence. Then feel for the staff in the wound; direct the point of your knife towards it, and carefully cut into the groove, where it lies in the membranous part of the urethra. All these incisions are, you will observe, made low down the perineum, that is, near to the rectum. I have already given you what I conceive to be sufficient reasons for avoiding incisions in the upper part of the perineum. I may add another, namely, that if the external part of the wound be in the lower part of the perineum, there is a depending orifice for the free discharge of the urine after the operation, which there would not be otherwise. There is also a great authority in favor of this mode of proceeding. Cheselden made his incisions in the way which I have mentioned, as is proved by the anxiety which he evinced to avoid injuring the rectum. Had he done otherwise, it would never have entered into his contemplation that the rectum was in danger.

The next step of the operation is the continuance of the incision along the posterior part of the urethra, and the dilatation of the neck of the bladder. Some recommend this to be accomplished by means of the common scalpel, with which you have made the external incisions, the point being steadily introduced along the groove of the staff, with the edge turned outwards, so as to divide the left side of the prostate. This was Cheselden's method of operating. I draw this conclusion from Cheselden's own account of his operation, not from the absurd statement published by his contemporary, Dr. Douglas, who evidently understood nothing of the matter, and, indeed, describes an operation which it is next to impossible to perform. But after having incised the prostate and neck of the bladder, Cheselden introduced the instrument which I now show you, the blunt gorget, so as

to dilate the wound still further, answering at the same time the purpose of a conductor for the forceps; and, as far as I can learn, this method was followed generally by the English surgeons up to the time of Sir Cæsar Hawkins. This celebrated operator, who exercised his skill, and acquired his reputation, within the walls of our hospital, caused one side of the gorget to be ground to a sharp edge, and thus converted the blunt into a cutting gorget. The cutting gorget of Sir Cæsar Hawkins (and all that have been since invented are but modifications of it) was intended to supersede the use of the knife in opening the neck of the bladder, at the same time that it answered the purpose of a blunt gorget in other respects. It would be presumptuous in me to say that the cutting gorget is not a good instrument, when it has been employed, not only by many of our more distinguished, but by some of our most successful lithotomists. Nevertheless, I cannot but think there are some considerable objections to it. The incision is made as it is being thrust into the bladder. In consequence of the thick wedge-like form of the instrument, the prostate, and especially a hard and enlarged prostate, offers to it considerable resistance. A certain quantity of force is necessary for its introduction; and if that force be not well applied, the beak may slip out of the groove of the staff into the space between the bladder and rectum,—an accident which is too surely followed by the death of the patient. Now I know that such an accident ought not to happen; but I also know that I have seen it happen to a very experienced and dexterous lithotomist. There is, of course, a still greater chance of its happening to an inexperienced lithotomist (and all are inexperienced in the first instance). These considerations lead me to recommend you not to begin with the cutting gorget: you may adopt it, if you please, afterwards. For my own part, although I have very frequently used the cutting gorget, I generally make the incision of the prostate with the knife which I now show you. You will observe that the blade is broad enough to divide a considerable portion of the prostate, as it enters the bladder, without its being necessary to increase the size of the incision by cutting laterally afterwards; and that, instead of a sharp point, it terminates in a beak, fitted to the groove of the staff. In ordinary cases, a knife of this kind, with a single cutting edge, is sufficient; but in cases of very large calculi, there are good reasons for dividing both sides of the prostate. There is no objection to this being done, that I can discover; and for such cases I have been for some time in the habit of using this double-edged knife, with a beak projecting from its centre.

Having made the opening into the membranous part of the urethra, you are to insert the beak of the beaked knife into the groove of the staff. You then take the handle of the staff into the left hand, depressing it at the same time. You depress your right hand also, so that the handle of the knife, which you hold in it, lies in the lower part of the external wound. You are now to push the knife along the groove of the staff into the bladder, with its cutting edge inclined outwards and a little downwards, towards the ramus of the ischium, if

you use a single-edged knife; but holding it horizontally, if you use one with a double edge. Let this be done slowly, cautiously, taking care that you do not lose the feeling of the beak sliding over the smooth surface of the staff for a single instant. Generally, as the knife enters the bladder, a few drops of urine escape, but never any large quantity. This being accomplished, you are to withdraw the knife along the groove of the staff in the same line in which you introduced it. Never cut with it laterally, except you find it afterwards absolutely necessary to do so, on account of the large size of the stone; for in cutting laterally, you will find it difficult to measure exactly the extent of your incision; and you may endanger your patient's life in consequence of your dividing the parts beyond the boundaries of the prostate.

The next step of the operation is to introduce your finger, directed by the staff, into the bladder, so that you may feel the parts which are divided, and determine whether the incision is properly made. If you operate on a child, or on a young and thin person, you may then at once introduce the forceps into the bladder. But if you operate on a full-grown person, and especially on one having a deep perineum, it will be prudent for you first to introduce this instrument, which we call a blunt gorget, previously to the use of the forceps. The blunt gorget is, as you perceive, an oblong plate of steel, turned up at the edges, so as to present a concave surface above, and a convex surface below. The handle is inclined downwards; and that extremity, which is opposite to the handle, gradually becomes narrower, and terminates in a beak similar to that of the lithotomy knife. The surgeon takes the blunt gorget in his right hand, and inserts the beak in the groove of the staff; then, holding the handle of the staff in his left hand, and depressing it at the same time, he carefully introduces the gorget into the bladder. Having done so, he withdraws the staff, and leaves the gorget in the wound.

The gorget is intended to answer the purpose of a director for the forceps. But it answers another purpose also; it is a dilator of the wound. The knife divides only a portion of the prostate. The gorget splits the remainder as far as its breadth allows it to do so. Do not for an instant suppose that this is any rude or violent proceeding. It is far otherwise. The incision of the prostate having been begun by the knife, the extension of it by means of the blunt gorget is accomplished with the greatest ease. If you perform the operation on the dead body in the way which I have described, and dissect the parts afterwards, you will distinguish very readily the clean smooth surface made by the cut of the knife, from the fibrous or striated surface, made by the splitting of the gorget. You will ask, Why not make such a division of the parts by cutting laterally with the knife? Why prefer the dilatation of the wound by the blunt gorget? My answer is, that the separation of the parts with the latter instrument causes no hæmorrhage; and that it ceases as soon as it reaches the margin of the prostate; that is, as soon as it reaches the condensed cellular membrane, which forms what may be called its capsule.

Before explaining the use of the lithotomy-forceps, I must show you its construction. One of the handles terminates in a ring, the other in a loop. The blades become broader towards the extremity; and their opposite surfaces are concave, and armed with small pointed projections, or teeth. When closed as far as they can be closed, the ends do not exactly come in contact. Thus they are well fitted to hold the stone, which they have seized, at the same time that, if the stone be not seized, it is impossible for them to pinch the mucous membrane of the bladder. This particular forceps is made according to the pattern of that which Cheselden employed on most occasions as described by Douglas, and you will find it very generally useful. You must not, however, rely on this alone: you must have forceps which are longer and larger: others much smaller, especially for operations on children. You should be provided, also, with curved forceps, to be used where the stone lies in the hollow behind an enlarged prostate gland.

The surgeon, then, holding the handle of the blunt gorget with the left hand, introduces the forceps with his right, along the concave surface of the gorget, into the bladder. This is to be done cautiously, and without violence. But it is to be observed, nevertheless, that the forceps will always experience a certain degree of resistance, and that some force is necessary to make them enter the bladder. You know when they have entered by the resistance ceasing, and, in many cases, by a gush of urine taking place at the time. In a deep perineum the forceps will have to penetrate to a great depth before reaching the bladder. This is one of the sources of difficulty and doubt to a young surgeon, who is apt to think that the forceps must have actually entered the bladder, when it has, in reality, penetrated no farther than the prostate. The forceps having been introduced, the gorget is to be withdrawn.

The surgeon is not to open and close the forceps at random. He is to use it at first as a sound, exploring the different parts of the bladder, until he has ascertained where the stone lies. The discovery of the stone will be very much facilitated by the introduction of the finger along the groove of the staff, previously to the introduction of the blunt gorget; at least in most instances. In a case of enlarged prostate and deep perineum, where the finger will not reach the bladder, this mode of examination is, of course, of no avail. The stone being touched by the forceps, the blades are to be opened upon it, and the stone is, in general, readily grasped. I have already mentioned a case in which the muscular coat of the bladder was ruptured in consequence of the surgeon too forcibly and hastily opening the forceps; and this will be a lesson to you as to your conduct in this part of the operation. But I conceive that the danger of such an accident as this is not the same in all cases. In some instances, when you begin the operation, the bladder is distended with urine; then, when the instruments enter it, the urine rushes out, not impelled by muscular action, but by its own gravity, and the pressure of the viscera. Under these circumstances, when you introduce your

finger into the bladder, you find the muscular tunic relaxed, with the mucous membrane hanging in folds; and, in consequence, they are not likely to be ruptured. In other instances, the patient voids his urine immediately before the operation, or, perhaps, during the introduction of the staff. Here, the urine, having been made to flow by the patient's own efforts, the muscular tunic is contracted: it offers a considerable resistance to the opening of the forceps, and is liable to be ruptured, if the blades are opened rudely and incautiously. It sometimes happens that a small stone lies, as it were, concealed in some part of the bladder, perhaps beneath a fold of the mucous membrane, so that you cannot easily bring the forceps in contact with it. You will then frequently succeed in seizing it in the following manner:—Expand the forceps gently and carefully, until the blades are widely separated from each other, holding them at the same time in such a position as that the blades open horizontally.

This dislodges the stone, and causes it to fall to the lower surface of the bladder; and then, as you close the forceps, you find that you have seized it. In other cases, where there is a tumor at the neck of the bladder, caused by an enlargement of the prostate gland, the stone is liable to be lodged behind the projection. You feel the stone; but the forceps slide over its surface, and does not grasp it. It is in such a case as this that the curved forceps is useful, being capable of dipping into the hollow behind the prostate. Under these circumstances, you may also find it useful to introduce the finger into the rectum, and raise the bladder, by the means of it, towards the pubes. It is evident, however, that this expedient can be of no use, except where the bladder is within reach of the finger, which it rarely is in a case of enlarged prostate.

The next thing to be done is the extraction of the stone with the forceps; and, simple as it may appear to be, there are several things to be attended to in this part of the operation.

The forceps is to be withdrawn from the bladder in the direction of the external wound. For the most part, it is better that the convexity of one blade of the forceps should be turned upwards, and that of the other blade downwards. Attention to this point is especially of consequence, in cases where there is an enlarged prostate gland, forming a tumor projecting into the bladder. The smooth convex surface of the blade of the forceps is not interfered with by the projection; whereas, if the forceps be turned in the other direction, the stone, coming in contact with the tumor, becomes as it were entangled by it, and the extraction of it is rendered difficult. The stone must be grasped with a certain degree of force, otherwise it may escape from the forceps. But, on the other hand, it is important that you should not, in ordinary cases, apply so much force as to crush it, for this will make the operation not only more difficult, and tedious, and painful, but also more dangerous. You should always endeavor to determine, before you proceed to the operation, what is the probable nature of the stone, in order that you may judge how far it is, or is not, likely to be easily broken. The lithic acid calculus is of a very

hard texture, and is borken with difficulty. The oxalate of lime calculus is also hard, but it is more brittle than the lithic acid calculus. If the urine be alkaline, without containing the adhesive mucous secreted by the bladder, you know that the external layer is composed of the triple phosphate, and a calculus of this kind is much more easily broken than either of those which have been before mentioned. But the most brittle of all, and that which requires the greatest degree of caution in its extraction, is the fusible calculus, formed partly by the triple phosphate of the urine, and partly by the phosphate of lime generated by the adhesive mucus secreted by the membrane of the bladder; and the greater the quantity of the adhesive mucus, and the larger the proportion of the phosphate of lime, the more liable is the calculus to be crushed beneath the pressure of the forceps.

If, having seized the stone, you find that it cannot be readily drawn through the neck of the bladder, you are to bear in mind, that this may be because you have hold of its long diameter. Let it then drop out of the forceps, and endeavor to seize it in a more convenient manner. In some cases you will find it expedient to dilate the wound of the prostate by a second incision. This, however, is never proper, except where you have divided only one side on the postate in the first instance. You may then introduce a straight probe-pointed bistoury, and make an incision in the opposite or undivided side of the prostate. But this is to be done with the greatest caution. A careless incision may occasion a frightful hæmorrhage, or it may extend beyond the boundaries of the prostate into the cellular texture external to it; and I have already explained to you how much this may endanger the life of the patient.

It is scarcely possible for me to say too much as to the caution necessary in the extraction of a large calculus. You must command not only all your skill, but all your patience; indeed, patience is here the greatest indication of skill. You are to draw it out gradually, endeavoring to dilate the parts through which it is to pass, instead of tearing them; and it is astonishing to what an extent this gradual dilatation may be accomplished, in the hands of a prudent surgeon. I have told you how important it is that you should avoid crushing the stone. But even this rule has its exceptions. A stone may be so large that no degree of gentleness and caution will enable you to extract it entire without extensive laceration of the neck of the bladder, extending into the surrounding cellular membrane; and, under these circumstances, it is the smallest of the two evils that it should be broken into pieces. The fragments are to be extracted one after another, larger or smaller forceps being used, according to circumstances. Some of the smaller fragments may be removed by means of this instrument, a kind of steel spoon, to which we gave the name of scoop; and the very smallest of all may be washed out of the bladder by introducing the pipe of a syringe into it, and injecting into it, a sufficient quantity of tepid water. You are to ascertain, at last, whether the whole of the fragments are extracted, by exploring the cavity of

the bladder carefully, by means of this straight sound introduced by the wound, and, in most cases, also, by examining it with the finger.

When a fusible calculus, containing a large proportion of the phosphate of lime, is broken, it often happens that some of the fragments are of so small a size that they remain like particles of coarse sand in the bladder, even in spite of all the precautions which you can take at the time of the operation, and further attentions are required. Let the patient recover of the first effects of the operation: then once or twice daily introduce a catheter by the urethra into the bladder, and inject half a pint of tepid water, or of a weak infusion of linseed, through it, by means of an elastic gum bottle. The liquid flowing in by the catheter will flow out by the wound, carrying the particles of sand with it; and thus, at last, the bladder will be emptied of them. In a case of enlarged prostate, indeed, this plan may not answer; as frequently the patient is not more able after the operation to empty the bladder by the wound, than he was before to empty it by the natural passage. For these cases you must be provided with a large catheter, having an aperture three or four times the size of that commonly made, close to the point, on the upper or concave side. The liquid being injected by the catheter, will be discharged by it also, carrying every time some of the small fragments of calculi with it, until none are left in the bladder.

It very rarely happens that you meet with an encysted calculus where you perform the operation of lithotomy. In fact, in the great majority of cases of encysted calculi, the bladder is diseased; so that they are quite unfit for an operation. However such an event occurs occasionally. A boy, about sixteen years of age, was admitted into the hospital in the year 1816. He had suffered a long time from stone in the bladder. There were these remarkable circumstances in this case; namely, that the stone could sometimes be felt distinctly with the sound, appearing to be of a large size, while at other times it could not be felt at all; and that, sometimes, when the bladder was empty of urine, it could be perceived distinctly with the finger from the rectum, while at other times, when there was urine in the bladder, it could not be detected at all by this mode of examination. In performing the operation, when I had introduced my finger into the bladder, I could, at first, discover no stone. At last I felt it on the anterior part of the bladder, behind the pubes. It was not lying loose in the cavity of the bladder, but evidently contained in a cyst, communicating with the bladder by a round opening. By means of a probe pointed bistoury, I carefully dilated the orifice of the cyst, and then, introducing my finger, separated the membrane of it from the calculus, until I was enabled to take hold of the stone with the forceps. The calculus is preserved among those in our museum. It was not only encysted, but adhering also, for it was brought away with a portion of the membranous lining of the cyst closely attached to it. The boy recovered.

After the operation your patient is to return to his bed, where he is to be laid on his back, with his shoulders and loins as much elevat-

ed as they can be without inconvenience, so as to make the wound in the perineum as depending as possible. The thighs are to be somewhat elevated by a bolster placed under the hams, and the knees are to be a little asunder. The urine flows, not through the urethra, but through the wound; and the first two or three succeeding gushes of it usually give the patient a good deal of smarting pain. In many cases, where there has been a deep perineum, and especially where the calculus has proved to be of a large size, I have introduced an elastic gum canula through the wound into the bladder, and allowed it to remain for the first two or three days; that is, until there was time for the surrounding parts to become consolidated by inflammation. Such a canula makes an excellent conductor for the urine. It keeps the bladder always empty, and prevents the pain which otherwise is experienced on the first passage of the urine. It prevents also that obstruction to the flow of the urine which sometimes occurs after the operation, in consequence of the wound having become plugged by a coagulum of blood. In cases in which the calculus has been of so large a size as to make it probable that, in the extraction of it, the soft parts have been lacerated beyond the boundaries of the prostate, the canula will answer another good purpose by lessening the danger of the urine becoming effused into the cellular membrane.

In ordinary cases the after-treatment is very simple. The wound requires little more than attention to cleanliness; for of what service can applications be to a wound, over which the urine constantly flows? It gradually contracts and granulates; and as it does so, the urine begins to flow by the urethra. As the wound becomes more contracted, more urine flows by the natural passage; and usually, in less than a month from the time of the operation, the function of the urethra is completely restored, and the wound is healed.

In a few cases there may be reason for applying leeches to the lower part of the abdomen, and in still fewer it may be right to take blood from the arm. Fomentations applied to the abdomen are sometimes proper also; and to this we may add the precautions necessary after most other operations with respect to the functions of the intestines, and the diet.

There are cases, however, in which still further attentions are required. Where the bladder is in a state of chronic inflammation is always aggravated by the necessary introduction of instruments at the time of the operation, and there is always an increased secretion of the adhesive mucus afterwards. Again, in some cases, where those symptoms did not exist previously, they are induced by the operation. Now, under these circumstances, the mucus being liable to deposit the phosphate of lime, and the whole of the urine being rendered alkaline, there is a great liability to a calculous formation, and it will often require much care to prevent this calamity coming a second time upon the patient. Opium, mineral or vegetable acids, and especially the decoction of the *pariera brava*, may be here resorted to with advantage. But I need not occupy your time by a detail of the treatment which is proper under these circumstances; it is sufficient

for me to refer you to what I said on this subject in the first of my Lectures on Calculous Disorders. In some of these cases, the whole of the wound becomes encrusted with a white calculous deposit. Stimulating applications to the surface of it are then likely to be useful; such as a lotion of a decoction of bark and tincture of myrrh, solution of the nitrate of silver, or of nitric acid. As by other means the urine is brought into a more healthy condition, these lotions promote the separation of the concretion from the surface of the wound, which then gets into a state to granulate and heal.

LECTURE XIV.

On the Causes of Death after Lithotomy.

It is much more agreeable to contemplate the cases in which our art is successful, than those in which it fails: but the study of the latter is not less instructive than that of the former; and I should be guilty of a serious omission if I were to dismiss the subject of lithotomy without endeavoring to explain the circumstances which render the operation hazardous; under which it is likely to shorten the patient's life, instead of leading to his cure.

I have already pointed out what I conceive to be the bad consequences of a too free division of the prostate gland. All that I have been able to observe for many years past has confirmed me in the opinion, that *an incision of the prostate, extending into the loose cellular texture surrounding the neck of the bladder, is replete with danger to the patient.* Such a division of parts is never necessary where the calculus is of moderate dimensions; but it cannot be avoided where it is of a very large size; and hence the extraction of stones of this description can never be accomplished without a great probability of the patient not surviving the operation.

The symptoms which arise in these cases are not well marked in the first instance. There is some heat of skin, and generally an absence of perspiration; there is usually an abundant flow of urine through the wound; the pulse, as to frequency, is somewhat above the natural standard; and the patient, although free from suffering, has no disposition to sleep. This state of things continues for twenty-four, or even for forty-eight, hours after the operation; then the more characteristic and alarming symptoms show themselves. The pulse becomes more frequent, rising to 90, 100, and at last to 140, in a minute; the heat of skin becomes still greater; the tongue dry; the countenance anxious. Afterwards, as you count the pulse, you fine every now and then a beat weaker than the rest; and then there are complete intermissions. At first the intermissions are not more than one or two in a minute; by degrees they become more frequent,

until they occur every third or fourth beat. There is an occasional hiccough; the patient complains of some degree of tenderness in the lower part of the abdomen, especially in the left groin; the belly becomes tympanitic, that is, the stomach and intestines are filled with air; the distention of the belly increases; the hiccoughs are more frequent; the pulse, continuing to intermit, becomes weak and fluttering. In some instances, the patient retains his understanding even to the last; while in others he falls into a state of low delirium previous to death. Occasionally, in the progress of such a case, the patient has a severe rigor, and sometimes he complains of a pain in the loins. Where these symptoms begin at an early period, he may die within forty-eight hours from the time of the operation; but in other cases, death may not take place for four or five days, or even for a week. On dissection, you find the cellular membrane round the neck of the bladder, and between the prostate and the rectum, bearing marks of inflammation, infiltrated with lymph and serum; and, to a greater or less extent, converted into a slough. If death has taken place at an early period, the intestines are found distended with air, and there is a very slight effusion of serum in that part of the peritonæum, which descends into the pelvis. But if the patient has labored under these symptoms for many days before he dies, the peritonæum, where it is reflected from the bladder to the rectum, is seen of a darker color than natural, and encrusted with lymph; and at a still later period there is the appearance of inflammation, to a greater or less extent, throughout the peritonæum generally. But the peritonæal inflammation is evidently not the primary disease: it is the inflammation and sloughing of the cellular membrane of the pelvis which has induced inflammation of the adjoining portion of that membrane. Something also is to be attributed to the tympanitic distension of the intestines, which if continued for a considerable time, is always liable to be attended with tenderness of the abdomen, and some degree of peritonæal inflammation.

It is important that you should not fall into the error of regarding such cases as I have just described as cases of simple peritonæal inflammation; for the remedies which would be useful in the latter case are injurious here. The abstraction of blood, or even the operation of an active purgative, will cause the patient to sink more rapidly, tending only to hasten his death. The proper system to be pursued is the opposite to that of depletion. The patient should take such nutriment as his stomach is capable of digesting. The bowels may be kept open by injections, or by the exhibition of some very gentle purgative; and ammonia, wine, and brandy are to be administered, when the state of the general system indicates that stimulants are necessary.

Under this kind of treatment I have certainly known two children to recover, who were effected in the manner which I have described. In one of the cases to which I allude, an abscess formed in the neighborhood of the neck of the bladder, which burst into the wound, and then the symptoms subsided. In the other a slough separated into

the rectum, and a fistulous communication remained afterwards between that bowel and the neck of the bladder; but it was of a small size, and productive of no serious inconvenience. In adults the chance of recovery is, at any rate, much smaller than in children. Can anything be done for their assistance in the way of local treatment? Let us consider how it is that the dangerous symptoms arise. There is suppuration and sloughing of the cellular membrane round the neck of the bladder, and the constitution is disturbed, as it is in a case of carbuncle; or, what is still more analogous, as it is in those cases in which there is sloughing of the cellular membrane of the scrotum, in consequence of the effusion of urine arising from the rupture of the urethra behind a stricture. And, in these cases, what is the practice recommended? Do we not divide the soft parts freely over the sloughing cellular membrane; and is not this operation productive of the most signal benefit? Is it possible to resort to any practice corresponding to this, in the cases now under our consideration? There is only one way in which this can be accomplished, namely, by laying the sloughing abscess open into the rectum. I made this experiment in one instance, and I will tell you the result. In September, 1825, I operated on a patient, a man between fifty and sixty years of age, laboring under stone in the bladder, in St. George's Hospital. The calculus was extracted without the smallest difficulty. But I performed the operation with what is called Mr. Blizard's lithotomy knife. This is a long, narrow, straight, probe-pointed bistoury, and you must cut with it laterally, in order that you may divide the prostate, so that it is difficult to determine the exact extent of the incision. Immediately after the operation, I had some misgivings, and was led to fear that I had made the incision to such an extent as to penetrate beyond the boundaries of the prostate. At first, indeed, the patient seemed to be going on as well as possible; but, in about forty-eight hours from the time of the operation, some unfavorable symptoms began to show themselves. On the third day the countenance had become anxious, the skin was hot, and the pulse occasionally intermitted. On the following day (the fourth) the pulse intermitted once in fifteen beats; the skin was hot and dry, and the abdomen began to be tense and swollen. I could not doubt that those symptoms existed which I had known to be the precursors of death in some other cases. Under these circumstances, with the concurrence of my colleagues, I performed the operation which I am about to describe. I introduced the forefinger of the left hand into the rectum. I then passed a probe-pointed curved bistoury into the wound, and quite to its farthest extremity on the left side of the neck of the bladder. The probe point having been felt through the tunics of the rectum, I pushed it carefully through them, and, drawing it downwards, divided the lower part of the rectum, sphincter and all. Thus the wound and the rectum were laid into each other. Little or no hæmorrhage followed. The relief was immediate. In five minutes after the operation the intermissions of the pulse had diminished from one in fifteen to one in fifty beats. In an hour it did not intermit at

all. During the two following days the patient appeared quite well; the pulse was regular, between 70 and 80 in a minute. On the next day there was a slight occurrence of the intermissions of the pulse, but it subsided on the exhibition of some brandy and ammonia. After this there was a progressive amendment; the pulse, however, continuing to beat between 80 and 90 in a minute for the two or three following weeks. After about a month, the wound in the rectum began to contract, and the urine to flow by the natural passage; and in another fortnight the patient went into the country, nearly the whole of the urine at this time flowing by the urethra.

I have already informed you that my experience does not justify me in stating, that, after the operation of lithotomy, there is no danger of death from hæmorrhage; and I have mentioned that I had myself the misfortune of losing one patient from this cause. This case, which occurred many years ago, was that of an old man, with an enlarged prostate and an unusually deep perineum. The blood seemed to proceed from the neighborhood of the neck of the bladder, and, what was remarkable, it was venous. I was foiled in all my attempts to restrain the hæmorrhage, and the patient survived the operation only a few hours.

I have known some other cases of death from hæmorrhage, occurring in the practice of other surgeons. It must be acknowledged, however, that such cases are but a very few out of a great number; and that the chance of a patient's bleeding to death, where the incisions are made low down, and are not more extensive than is really necessary, and where proper attention is paid, and proper precautions are used, after the operation, is so small, that it need not enter into your calculations. I speak of attention and precautions after the operation; for, without these, I suspect a dangerous hæmorrhage would occur more frequently than it does. I performed the operation on an old gentleman, and extracted a large calculus. But a still larger stone remained in the bladder, which could not be extracted through the incision which I had made, without the application of what I conceived to be a dangerous degree of force. I therefore made another incision in the right side of the prostate, with a straight probe-pointed bistoury, and the calculus was then easily extracted. A frightful hæmorrhage followed the last incision; so that I have no doubt that the patient would have died from loss of blood, if an assistant had not pressed the internal pudic artery against the bone with his finger for several hours. Some years before this, soon after I had been elected assistant surgeon in the hospital, Sir Everard, then Mr. Home, operated on an elderly man for calculus in the bladder. There was a considerable bleeding at the time of the operation, but it was not much regarded, and the patient was taken to his bed. About half an hour afterwards, the nurse came to me in great alarm, saying that the *stone-patient* was bleeding to death. When I reached his bedside, I found him pale and yawning, the bed drenched with blood, and a complete puddle of blood on the floor under the bed also. I drew him to the end of the bed; and, having placed him in the position in which

he had been placed for the operation, found the blood still flowing from the wound. On pressing the internal pudic aretry of the left side against the bone, by means of the finger, the hæmorrhage was immediately suspended. Fortunately the patient was a thin person, and, without any great difficulty, with the asistance of a small flexible silver needle, I was enabled to pass a ligature round the trunk of the pudic artery. This fully answered the intended purpose. The patient was saved; but, if assistance had been delayed even a few minutes longer, it must have been unavailing.

I have sometimes heard it observed by by-standers, when a patient has lost a good deal of blood at the time of the operation, "that he has lost no more than it will do him good to lose." I have, however, great doubts whether, even in the case of the strongest man, the losing much blood adds to his chance of recovery; and it is evident that, in the case of a person of originally weak constitution, or of one whose bodily powers are exhausted by the previous sufferings, or who labors under disease of the kidneys or other organs, the loss of a considerable quantity of blood in the operation is likely to make all the difference between its success and failure.

I may take this opportunity of observing, that secondary hæmorrhage sometimes occurs after lithotomy: I suppose, in consequence of the separation of the slough. A little boy, on whom I had operated, lost, what was for him, a large quantity of blood; and (if I recollect right, for I have no notes of the case) some time in the second week after the operation. He was excessively lowered by the hæmorrhage, but ultimately recovered. Mr. Earle related to me a case of hæmorrhage seven or eight days after lithotomy, which occurred to him in St. Bartholomew's Hospital. The bleeding was sufficient to be alarming; but he succeeded in stopping it by introducing through the wound into the bladder a tent, composed of a quantity of lint, wrapped round an elastic gum catheter.

Patient's may, and continually do, recover, in whom circumstances have occurred causing the operation to be protracted for a considerable time. Nevertheless, other things being the same, there can be no doubt that, as the operation occupies a longer time, so it is more dangerous. When I was a student at the hospital, a large fat man, with a very large calculus, submitted to the operation. He was in good health otherwise; but the stone broke into a number of fragments. There was a deep perineum; and these circumstances combined made the operation very difficult, although performed by a very skilful surgeon. The patient was more than an hour on the table. He died very soon after being taken back to bed, manifestly from exhaustion.

The causes of failure which I have already enumerated are connected with circumstances which occur during the operation, and which may be supposed to be, to a certain extent at least, under the control of the surgeon. But there are other cases, in which death takes place as a consequence of the operation, although nothing has happened in the performance of it which the most anxious surgeon

could wish to have been otherwise. Some individuals are good subjects for the operation, and recover, perhaps without a bad symptom, although the operation may have been very indifferently performed. Others may be truly said to be bad subjects, and die, even though the operation be performed in the most perfect manner. What is it that constitutes this essential difference between these two classes of cases? It is, according to my experience, the presence or absence of organic disease. A patient with organic disease of other organs has a smaller chance of recovery than he would have had if such disease did not exist; but in organic diseases of the urinary organs, the kidneys, or bladder, or parts connected with them, that is to be especially apprehended, as increasing, ten-fold, the hazard of the operation. Of persons in whom the calculus is not of large size, on whom the operation is performed, I will not say very well, but not very unskilfully, and who are free from all organic disease, there are very few who do not recover; while, of those, in whom organic disease exists, there are few who do not die. It becomes, then, the duty of the surgeon to consider what are the organic diseases most likely to occur in combination with stone in the bladder, and how they are to be recognised in the living person, in order that he may be enabled to judge, before he proposes an operation, or before he accedes to the patient's wishes that he should undertake it, how far it is, or is not, probable that it may prove successful.

The common enlargement of the glands, such as occurs in old men, and existing in a moderate degree, does not, as far as my observation extends, add to the danger of the operation. In fact, it succeeds, on the whole, better in old men between seventy and eighty years of age, than in those who are ten or twenty years younger, although the former are likely to have the prostate of a larger size than the latter. An excessive enlargement of the prostate, however, is to be regarded as an unfavourable circumstance, inasmuch as, by adding to the distance between the bladder and skin of the perineum, and placing the bladder beyond the reach of the finger, it increases the difficulties of the operation to an extent which cannot be well estimated by one who has not had personal experience of what those difficulties are. I may take this opportunity of mentioning, that I have performed the operation on two individuals, who for some years previous, in consequence of the enlargement of the prostate, had been unable to void a drop of urine without the aid of the catheter. The first of them remained in this respect after the operation, exactly as he was before, and required the use of the catheter, even while the wound in the perineum was still open. The other has not only regained the power of making water, but at this time, two years after the operation, is still able completely to empty his bladder by his own efforts.

It sometimes happens that the prostate gland, where it projects into the bladder, is ulcerated. I have formerly explained to you what are the symptoms produced by this combination of ulcerated prostate and calculus in the bladder. It remains for me to tell you the result of the operation of lithotomy, performed under these circumstances.

When I was a very young member of our profession, I was present at two such operations. In the first of these cases the operation was recommended by two of the most eminent surgeons who were then in practice. It was performed, to all appearances, dexterously, occupying scarcely three minutes. The patient died within ten minutes after he had been replaced in bed. In the second case the bladder contained eighteen or twenty calculi (I believe more), which, of course, made the operation more tedious. As soon as it was over, the patient fell into a state of stupor, from which he never recovered. He died in about twelve hours.

Chronic inflammation of the mucous membrane of the bladder is not very uncommon in cases of stone in the bladder ; and although by no means a favorable circumstance, it is not to be regarded as so unfavorable as to justify you in declining to perform the operation on this account ; indeed, if you were to do so, all your patients with fusible calculus would be left to die, for it is on this chronic inflammation that the deposition of the mixed phosphates, which constitute the fusible calculus, usually depends. But chronic inflammation of the mucous membrane is sometimes aggravated, so much so, indeed, as to assume the characters of acute inflammation. The inclination to void the urine is then incessant, night and day, preventing sleep, and attended with horrible suffering. The urine deposits a large quantity of offensive, ropy, adhesive mucus, of a red color, in consequence of blood being blended with it. Such cases as these are unfavorable for the operation. It may hasten the patient's death ; or more frequently the patient will die in spite of it, and the operation will have the credit of having occasioned his dissolution. I have twice performed the operation under the circumstances which I just mentioned. In neither case did I recommend it, but the contrary. The patients, however, required it of me, being driven to it by excessive suffering ; and I performed it in compliance with their wishes, as a matter of duty. I will tell you the result. The first patient experienced great and immediate relief. The wound granulated, and was completely healed in less than three weeks ; but nevertheless it was evident that there was something wrong. The patient was languid and listless, incapable of exertion, and not even desiring to make it. At the end of a fortnight, or rather more, he began to complain of pains, like those of rheumatism, but more severe, in the shoulder, arm, and other parts of the body. He had rigors, gradually became weaker and weaker, and died about a month after the operation. On examining the body, the mucous membrane of the bladder was found still bearing the marks of much inflammation. The inflammation had extended to the cellular membrane external to the bladder, which was, in some parts, infiltrated with lymph and serum; and a small quantity of pus had been effused in the neighborhood of one ureter. One of the kidneys was almost completely wasted; but this was manifestly the result of disease at some former period, and, in all probability, had no immediate connection with the patient's death. In the second case there was also great immediate relief; so that for some days there were no bad

symptoms of any description, and I told the patient's friends that all danger from the operation was at an end. But at the end of about a week from the time of the calculus having been extracted, he began to sink. It was difficult to say what he ailed, but it was evident that his physical powers were on the decline; and in the course of four or five days more he died. On examining the body, the mucous membrane of the bladder was found to be of a dark color, in consequence of its vessels being very much loaded with blood. The same appearance was traced along the membrane of the ureters to the pelves and infundibula of the kidneys, and these last-mentioned parts were distended with what appeared to be an admixture of pus and adhesive mucus.

From what I have seen in some other cases, I am led to believe that these patients would have died nearly as soon, perhaps quite as soon, if the operation had not been performed. They died, as I have already said, in spite of the operation, and not in consequence of it. But these are distinctions which the public, and even some members of our own profession, do not comprehend. It is desirable, on all accounts, to avoid, if possible, performing an operation under these peculiar circumstances. Such cases only tend to bring it into disrepute, and prevent some other persons submitting to it, in whom there might be scarcely a doubt as to its success.

In the last-mentioned case there was disease in the kidneys, the consequence of inflammation extending upwards along the ureters, from the mucous membrane of the bladder. But disease originating in the kidney, where the bladder itself is in a healthy state, equally adds to the danger of the operation. The patient is unable to bear the shock which the operation gives to his nervous system, and dies either immediately after the operation, or before the wound is healed. It is true that he labors under a mortal disease; and that he would have died sooner or later if the operation had not been performed; but the operation hastens his death, and is therefore to be avoided.

A boy sixteen years of age, a midshipman in the navy, had for many years labored under severe pain in the loins, and latterly had suffered from the usual symptoms of calculus in the bladder. The poor fellow, however, went on doing his duty on board ship, until he could do it no longer. He was then placed under my care. His sufferings from the calculus were excessive; and, in addition to these, he had severe pains in the loins, and occasional rigors. The urine was turbid, and when exposed to heat, or on the addition of nitric acid, exhibited a large deposit of albumen; and Dr. Prout, who was consulted with me, detected some other circumstances connected with its chemical composition, which he had never before noticed, except in combination with organic disease of the kidney. Besides all this, the patient was depressed and languid, and losing flesh. Under these circumstances, Dr. Prout and myself strongly advised that he should not undergo the operation. Some time afterwards, however, his sufferings from the disease became so severe; that he declared he would rather die than submit to them any longer; and, at the earnest

request of himself and his friends, I removed the stone from the bladder. It was of a middle size, and composed of the oxalate of lime. Every thing in the operation and immediately after it was as favorable as possible. For the first week, the patient seemed to go on well; he was free from pain, and happy, and his health improved. The only remarkable circumstance was an enormous secretion of urine, amounting to diabetes. At the end of a few days this ceased, but it was followed by a profuse diarrhœa. There was a succession of watery evacuations from the bowels, which nothing could check. He became weaker and weaker, had a shivering, and died before the usual re-action took place, about a fortnight after the operation. On examining the body an enormous abscess was found in one kidney, and connected with it, five or six calculi of the oxalate of lime, of various sizes and of irregular shapes.

The following remarkable case occurred in this hospital in the year 1808. Sir Everard (then Mr.) Home performed the operation for stone in the bladder on a boy seventeen years of age. The patient was in a state of depression previous to the operation; but with such knowledge as existed at that time on these subjects, it was not supposed that there were any sufficient reasons why he should not undergo it. In the course of the following night, however, he died. On dissection, the bladder was found inflamed, and the mucous membrane ulcerated. The ureters, pelves, and infundibula of the kidneys were dilated. The kidneys themselves were of a pale color, and in the upper part of each of them was a large abscess. The abscess connected with the right kidney had burst into the abdomen (probably at the time of the operation), and not less than half a pint of pus had become effused into it immediately below the liver.

Before determining on lithotomy, you have no more important duty to perform than that of inquiring into the state of the kidneys. I have already explained to you what symptoms mark the existence of disease in the kidneys, connected with calculi. One thing to be especially attended to, with a view to a correct diagnosis, is the state of the urine. The urine may be alkaline, and thus in an unnatural state, and yet the kidneys may be free from organic disease, and the patient a proper subject for the operation. It is purulent and turbid urine, loaded with albumen, by which your apprehensions as to the result of an operation will be chiefly excited. Albuminous urine, however, where all other circumstances are quite favorable, is not a sufficient reason for your declining the operation. I had a patient with stone in the bladder, a gentleman sixty years of age, whose urine was constantly turbid when first voided, depositing albuminous or fibrinous matter afterwards. At first, I hesitated to recommend the operation; but finding that he had no other bad symptoms, my opinion altered. I performed the operation; the patient recovered without the smallest untoward circumstance occurring, and lived for several years, dying at last of another complaint.

Success in lithotomy must undoubtedly depend in a great degree on the manual skill of the surgeon, and on the mode in which the opera-

tion is performed; but it depends still more on the condition of the patient with respect to his general health, especially on the existence or non-existence of organic disease. Not a little may be attributed to accident, which may at one time throw in your way a succession of cases which are favorable, and at another time a succession of cases which are unfavorable, to the operation; and hence it has often happened, that a surgeon who has been fortunate in the results of his practice as a lithotomist at one period, has been unfortunate at another. An experienced surgeon has generally had an advantage over others, in consequence of his greater skill in diagnosis, by which he is enabled to determine whether the constitution is, or is not, oppressed by any organic disease, especially of the urinary organs, and parts in immediate connection with them. What I have said in former Lectures, will, I trust, be found of use to you on these occasions. But let me give you one caution more: never hastily proceed to an operation where a calculus has existed in the bladder for a great number of years. It is in such cases especially that you are to expect it to be of great magnitude, and that you are also to apprehend the existence of disease in the bladder or kidneys, or abscess in the cellular membrane of the pelvis. Be assured, that the operation seldom fails where it is resorted to at an early period; but that there is always danger in delay. Many an individual, influenced by his own fears, or in compliance with the absurd advice of his friends, has missed the period at which an operation would have been almost free from danger; has dragged on an anxious and uncomfortable existence, month after month, and even year after year; trying, at one time medicines prescribed by regular physicians, and, at another time, medicines prescribed by quacks—all to no purpose; and at last has been driven by his sufferings to make up his mind to undergo the operation, when his condition has become so altered, that a prudent surgeon would either altogether decline to undertake it, or would perform it with great unwillingness, and solely as an act of duty, or, if you please, of humanity, towards a suffering fellow-creature.

On some other Methods of Lithotomy.

Whatever advances may have made in the other parts of surgery, it may be confidently asserted, that there has been no real improvement in the lateral operation of lithotomy since it was practiced by Cheselden, more than a century ago. The method which I have described to you is, indeed, that of Cheselden, from whom it has been adopted generally, not only by the operators of this country, but by those of the continent of Europe.

There have not been wanting, however, ingenious persons, who have endeavored to extract calculi from the bladder in other ways, in the expectation of discovering an operation simpler, or safer, than that of Cheselden. Of late years, an attempt has been made in Paris to revive the high operation, in which the incision of the bladder is made

at its fundus, where it lies behind the pubes, and immediately below the part at which the peritoneum is reflected over it. The high operation was, indeed, recommended by Cheselden himself, in the early part of his career; but he soon abandoned it for the lateral operation, from which last method he never deviated afterwards. The late advocates for the high operation, however, suppose that they have made in it in essential improvement, inasmuch as they adopt means for keeping the bladder empty of urine afterwards, so as to allow the wound in its fundus to heal, without the danger of an effusion taking place into the surrounding cellular membrane. For this purpose some make an incision into the urethra from the perineum, from which they introduce an elastic gum canula into the bladder: while others employ the simpler expedient of a gum catheter introduced, by the urethra in the usual manner. I have been present on three or four occasions, when the high operation was performed; but nothing that I have witnessed would lead me to recommend it to you; nor, indeed, does it appear to me that you would be justified in the performance of it, except in the case of a thin person, with a stone of so large a size, that the extraction of it by the usual method would be either impracticable, or attended with the greatest risk to the patient's life. But even for cases such as these, it may be a question, whether there is not a better method of proceeding, in the recto-vesical operation; in which the incision of the perineum is made to extend through the tunics of the rectum and the *sphincter ani* muscle. Here the parts which afford the chief resistance to the extraction of a large stone are divided; and, although the incision of the neck of the bladder extends beyond the boundaries of the prostate, the ill consequences arising from the escape of urine into the cellular membrane are likely to be in great measure obviated, in consequence of the free opening which has been made into the rectum. If you refer to a case which I have already related, in which, some days after the removal of a calculus by the usual method, I was induced to lay the wound of the perineum, as far as the neck of the bladder, completely into the rectum, you will find in it much in favor of the recto-vesical operation in those cases, in which the great bulk of the stone makes an extensive incision of the prostate and bladder necessary. Further than this, I have little to offer, from my own experience, on this subject. In the only instance in which I performed the recto-vesical operation, the patient, who had suffered from a stone in the bladder for more than twenty years, died in about three weeks, with abscesses in the kidneys, and a large abscess on one side of the pelvis, having no communication with the wound, and which I believe to have existed long before he came under my care. The stone in this case had been supposed to be of an unusual magnitude. It proved to be much smaller than was expected; but I felt convinced at the time, that if it had been many times larger than it was, it would, nevertheless, have been extracted with the greatest facility.

Calculi of the Prostate Gland.

Calculi occasionally form in the ducts of the prostate gland. In the museum of this hospital there is a preparation of an enlarged prostate, in every part of which are found minute calculi, none of them bigger than a pin's head, and too numerous to be counted. In general, however, they are fewer in number, and larger in size; I have seen them as large as a pea, or even as a horse-bean. They are composed of the phosphate of lime, of a light brown color, and not unfrequently are smooth and somewhat glossy on the surface. I believe that they frequently exist for a considerable time, without the patient being aware that he labors under any kind of disease. In other cases they cause a sense of irritation, referred to the perineum and neck of the bladder, and sometimes a difficulty of making water; so that patients have applied to me, supposing themselves to labor under a stricture of the urethra, whose real complaint was the formation of prostatic calculi.

We know of no medicine that is capable of preventing the formation of this kind of calculus; and in ordinary cases there seems to be nothing for us to do, beyond the occasional introduction of a full-sized bougie, to keep the urethra dilated, and thus favor the escape of the calculi, as fast as they become disentangled from the ducts of the prostate, in which they have been generated.

There are some cases in which a number of these calculi are collected in a cyst in the prostate gland, plainly perceptible by means of a metalic sound introduced into the urethra, and just before it enters the bladder; to be felt also from the rectum, sliding on each other under the pressure of the finger. In a case of this kind you may introduce a staff into the urethra: and with this for your guide, make an incision in the perineum extending to the prostate, but not into the bladder, and thus extract the calculi. Several years ago in a case of this kind I succeeded in removing a large number of prostatic calculi with the assistance of Weiss's urethra forceps. There is always danger of some of these calculi finding their way into the bladder, and thus laying the foundation of calculi of that organ. This happened in the case to which I have just referred; so that, after I had completely emptied the cyst of the prostate, I had to remove a considerable number of calculi, of a still larger size, but of the same chemical composition, from the cavity of the bladder.

Treatment of Calculus of the Female Bladder.

In women, calculi of a small size are expelled, as they are in the male sex, without ulceration, or other injury to the urethra, and without the patient suffering any inconvenience afterwards.

Calculi of a very considerable size occasionally escape from the female bladder; but the natural cure in these cases is effected by a less

simple process. A woman was admitted into our hospital, under the care of the physicians. On inquiring into her case, the apothecary of the hospital found a large calculus lying in the vagina, and he extracted it with his fingers. The urethra and vagina had ulcerated, and the calculus had passed through the ulcerated opening. The patient was thus relieved of the disease under which she had for a long time labored; but it left another and very distressing disease behind it, namely an incontinence of urine. Many cases similar to this have been recorded by writers; and you will find a paper on the subject, which is well worthy of your attention, by Dr. Yellowly, in one of the volumes of the Medico-Chirurgical Transactions. There is reason to believe that incontinence of urine always follows the natural cure, where the calculus has made its way out of the bladder by ulceration.

The peculiar structure of the female urethra renders it much more capable of dilatation than the urethra of the other sex; and stones of considerable size may be removed in this manner, without the aid of any cutting instrument. If you look over the early volumes of the Philosophical Transactions, you will find that this is no new invention; but the operation had fallen into disuse, and, indeed, I may say that it had been forgotten, when it was revived by Mr. Thomas. Mr. Thomas was called to a lady, who, I know not for what purpose, had deposited an ivory toothpick, three inches long, in her bladder. He introduced a piece of sponge tent into the urethra; as the sponge swelled, the urethra became dilated, and the toothpick was then easily extracted. Since then the same operation has been performed by Sir Astley Cooper, and various other surgeons. I have myself employed this method in several instances. In the first, I accomplished the dilatation by means of a piece of sponge tent; in the others, I made use of the dilator which Mr. Weiss has invented for this purpose, and which is undoubtedly to be preferred to the sponge tent, as it enables you to dilate the parts very gradually, and does not interfere with the free escape of the urine. None of these suffered from actual incontinence of urine, but one of them in whom the calculus was of large size could not retain more than two or three ounces of urine in the bladder afterwards.

When you attempt the dilatation of the female urethra, I would advise you to proceed gradually. The process, however, may in most instances be completed, and the stone extracted, in less than twenty-four hours. If you use the sponge tent, it should be of that kind which is made by compressing a piece of wet sponge between two pieces of board in a vice, or under a heavy weight, and not that prepared with wax; and the tent should be once or twice removed and renewed, in order that it may be increased in size, and also that the patient may not suffer from retention of urine.

But the method of dilatation is not to be recommended except in cases of calculi of moderate size. Where the stone is large, an incision of the urethra is necessary for its extraction; and this may be accomplished in the following manner:—Introduce a director or straight staff into the urethra and bladder, and then, by means of a

cutting gorget, a common straight bistoury, or the *bistouri cache* divide one side of the urethra, dilating that canal to a sufficient size for the introduction of the forceps. It has been most usual to make the incision of the urethra obliquely downwards and outwards, so as to include a small portion of the vagina. The bladder is completely within reach of the finger, and nothing can be more easy or expeditious than the method which I have just described. But the patient is generally subject to the great inconvenience of an incontinence of urine afterwards. I need not tell you how important it is that such a result should be avoided. The late Mr. Hey of Leeds, in one instance, after the operation, introduced a tent, formed of a roll of linen, into the vagina: I conclude that this was done with a view to keep the cut surfaces in a state of apposition, and cause them to unite by the first intention: at any rate the experiment succeeded, and the patient was able to retain her urine afterwards. I repeated Mr. Hay's experiment in a case in St. George's Hospital, but not with the same success. The patient, however, was a young and restless child: it was difficult to retain the tent in the vagina, and I do not think that, in this instance, the method was fairly tried. I have not repeated the experiment, as I have been informed that it has failed in other hands.

I was led to believe that the whole of the female urethra could be dilated easily, and to a great extent, with the exception of the external orifice, and, under this impression, in the next case which came under my care, I tried another modification of the operation. Having introduced a straight staff into the urethra, I made a small incision extending through the peculiar structure which surrounds the orifice of that canal, but no further. The wound did not extend more than one third of an inch in any direction. I was then enabled gradually, and with very little force, to introduce a pair of forceps, and extract the calculus. The patient after the operation was not troubled with actual incontinence of urine. She could retain it for one or two hours, but not so long as an ordinary person. The calculus, however, in this case, was not above an average size; and I do not suppose that the same method of operating would be found applicable to a case in which it was of large dimensions.

Soon after this I had an opportunity of trying another method of operating, which, as I was informed, had been adopted by an eminent provincial surgeon, and which had not been followed by the usual incontinence of urine. I introduced a *bistouri cache* into the urethra, having previously fixed the screw in the handle of the instrument, so that the cutting edge could not be made to project more than to a very small extent; perhaps to about one sixth of an inch. Then drawing out the *bistouri*, with the cutting edge turned directly upwards, I endeavored to divide the membrane of the urethra immediately below the symphysis of the pubes, without allowing the incision to extend into the contiguous cellular structure. The next step of the operation was to introduce Weiss's dilator, and dilate the urethra, so as to allow of the introduction of the finger, and afterwards of the forceps, into the bladder. As the urethra now offered no resistance,

this dilatation was readily effected in the course of a few minutes; and thus the stone was extracted. The patient, like the preceding one, did not suffer from actual incontinence of urine after the operation; she could not, however, retain it for so long a time as before the disease existed; I believe not longer than two hours.

But I have performed the same operation since in several other cases with a still more favorable result. In two of them I ascertained that the urine was perfectly retained afterwards. The stones, however, in these cases were of moderate size. Where the stone is large, I suspect that there is no method of removing it entire from the female bladder without an incontinence of urine, to a greater or less extent, being a consequence of the operation.

LECTURE XV.

LITHOTRITY.

Until within the last few years, lithotomy was the only method practised by surgeons for the purpose of extracting calculi from the bladder. In the year 1821, Sir Astley Cooper first succeeded in the removal of small calculi by means of the urethra forceps. Since then a still more important addition has been made to our means of relieving patients afflicted with this malady, by the invention of an operation which has for its object to crush the calculus, and thus enable it to escape, or be withdrawn from the bladder and urethra in fragments.

Various individuals have claimed some share of the credit of introducing this operation to the world. As long ago as the year 1775, General Martin, then a resident in India, contrived to pass an instrument through his urethra into the bladder, which he employed as a rasp, by means of which he was enabled to detach small fragments of a calculus. It was generally believed that he had succeeded in effecting a cure of his complaint. But the report was exagarated, as is proved by the singular history of his case, published by Sir Everard Home at the end of the second volume of his Observations on Diseases of the Prostate Gland.

In the year 1817, Mr. Elderton, formerly a student in attendance on my lectures, sent for my inspection the plan of an instrument which he proposed to make with a view to this kind of operation; but, as far as I know, no such instrument was ever employed on the living person.

But whatever may have been thought, or said, or planned by others, there seems to be no doubt that the individual who first actually practised this method of treating calculous disorders was M. Civiale of

Paris, and to him therefore the world is mainly indebted for this great improvement in surgery.

It scarcely ever happens, however, that an invention is perfect in the first instance; and the operation which I am about to describe is not that which was introduced by M. Civiale formerly, nor which that distinguished surgeon himself practices at the present time.

Many years ago Mr. Weiss made an instrument on the principle of what I have called the sliding forceps, having a screw attached to it for the purpose of dividing calculi, while still in the bladder, into fragments; but it was of rude construction, as it then was, was certainly not fitted for use on the living person.

Some time after M. Civiale had begun to practice the mechanical destruction of calculi in Paris, Baron Heurteloup engaged in the same undertaking in this country. At first he pursued M. Civiale's method of operating; but finding it liable to some very serious objections, he adopted the principle of sliding forceps invented by Mr. Weiss, at the same time modifying its shape so as to render it more convenient for being passed into the bladder, and for seizing and retaining the stone afterwards. Besides this he made another change in the instrument, rejecting the screw, and substituting for it a peculiar apparatus which enabled him to crush the calculus by the stroke of a hammer. Now the first of these alterations made by Baron Heurteloup I believe to have been of essential importance; in fact, without it the instrument would have remained wholly inapplicable to any useful purpose. But as to the second alteration I cannot say that any thing that I have seen, either in my own practice or in that of others, would lead me to regard it as being any improvement whatever. On the contrary, all the experience which I have had would lead me to believe that in those cases, to which this operation can be properly applied, there is nothing that can be done by the hammer which may not be done quite as effectually by the screw, while the latter method is not liable to many serious objections which may be urged against the former.

It is not, however, my intention to enter into any critical discussion of the comparative merits of these two methods of proceeding. My principal object in these lectures is to give you the results of my own experience, to put you as nearly as I can do so in my own place; and I shall, therefore, without further comment, proceed to explain the steps of the operation which I have myself adopted, and which I would recommend you to practice.

The instrument made by Mr. Weiss, and which seems to me to be not capable of much improvement, consists of a very strong sliding forceps, having adapted to it a handle, in which is a screw, by means of which the forceps may be closed with sufficient force to break the calculus, which is seized between the blades. The average length of Mr. Weiss's instrument is about eleven inches exclusive of the handle. It is quite straight for about the first nine inches, while the remaining two inches, or two inches and a half, at the extremity remote from the handle, are bent with a more sudden turn than is usual in a catheter. You will require to be provided with several instruments

of this kind of various sizes, and with some variety of shapes. For calculi of a small size the construction (except as to the addition of the screw) need scarcely differ from that of the common urethra-forceps which I described formerly; but for larger ones the opposite blades of the forceps should be furnished with projections or teeth; and for those of a still larger size you will find it convenient to be provided with a forceps, in the fixed blade of which there is a longitudinal slit, while there is a corresponding wedge-like projection, fitted to enter the slit, in the opposite surface of the movable blade. In using this instrument you will extract no fragments of the calculus at the time; they will drop into the bladder through the longitudinal aperture; but there is this advantage in it, that it will enable you to crush a calculus which might not be easily crushed otherwise, and, in fact, one of any magnitude.

On some occasions you will require an instrument of greater length than those which I have mentioned. I have one thirteen inches long, which I had made for a patient with an enormous irreducible inguinal hernia, and in whom the common forceps would scarcely reach the neck of the bladder.

The diameter of the lithotrity-forceps may vary according to the size of the calculus and that of the urethra. As a general rule, and as a measure of security, it should be as large as the urethra will readily admit. With the same view care should be taken that the steel is properly tempered, sufficiently so to prevent it being liable to bend, and not so much as to make it brittle.

For obvious reasons the lithotrity-forceps should be of a cylindrical form in every part, except, of course, in the handle. You will, however, find it convenient to be provided with one, the blades of which beyond the curvature are somewhat flattened, and in proportion broader than elsewhere. I saw such an instrument in the hands of M. Civiale, and have found it very useful for the purpose for which he recommends it; namely, the seizing and crushing the smaller fragments after all the larger ones have been disposed of.

I shall point out to you hereafter the class of cases to which, as it appears to me, this operation is especially applicable. But it being admitted that a particular case is of this description, still it is necessary that the patient should be placed in the most favorable condition for the performance of the operation, and some preparatory measures are usually required for this purpose.

As I have observed on a former occasion, the forceps should never be used in an empty bladder, nor in one which cannot retain at least six ounces of water without inconvenience. Often when you are first consulted the bladder is so irritable that the patient strains to empty it even when there is not more than two ounces of urine in it. Under these circumstances he ought to remain, not only in a state of repose,

but absolutely in the recumbent posture, and once daily, or in some instances on the alternate days, a catheter having been introduced, some ounces of tepid water should be injected into the bladder by means of a syringe. In this manner the bladder will be gradually rendered more capacious, so that in the course of a week or ten days you will be enabled to proceed to the operation.

It may be that the bladder is not only irritable, so that it will not contain more than a very small quantity of liquid, but that its lining membrane is affected with a chronic inflammation, causing a large deposit of adhesive mucus in the urine. Here, also, it is advisable to defer the operation, and in addition to the recumbent posture, and the injection of tepid water, you may prescribe narcotics, the decoction of the *pareira brava*, and such other remedies as are useful in cases of chronic inflammation of the bladder under other circumstances. An abundant formation of adhesive mucus always forms a great objection to any attempt being made to crush a calculus; first, because it indicates such a condition of the bladder as would render it but ill capable of bearing the disturbance which the operation must in a greater or less degree occasion; and, secondly, because the circumstances of the fragments of the calculus being liable to become entangled in the viscid secretion forms a considerable impediment to their being seized by the forceps, as well as to their escape afterwards. It is otherwise where the mucus exists only in small quantity. This forms no objection to the performance of the operation; and indeed it will often happen that the bladder is sensibly relieved, and that the mucus altogether disappears after the first crushing of the calculus, and even before there has been time for any of the fragments to come away.

It is necessary that the urethra should be capable of admitting an instrument of sufficient size and strength for crushing the calculus. A small urethra may be required to be dilated by the occasional introduction of a bougie. In some instances there is a natural contraction of the urethra immediately behind, or even within the glans, which cannot easily be dilated by common means, and which it is best to divide with a bistoury.

I shall explain hereafter that there are certain states of enlarged prostate gland which are very unfavorable to the operation, making it either very difficult or wholly impracticable. There are other cases in which there seems to be a tumid condition of the prostate gland, forming no small impediment to the introduction of the instrument, and rendering the part liable to bleed on the attempt being made, but which being the result of accidental causes will subside after a few days of constant repose in the recumbent posture. I have observed this state of things to exist especially after travelling in a carriage; and it forms one of many reasons, where the patient has come from a distance, for not recommending the operation to be had recourse to until he has had ample time to recover from the fatigues of his journey.

It being supposed that the necessary precautions have been taken, and that there is no reason for further delay as to the performance of the operation, we have to consider the steps of the operation itself.

The patient should be placed in the recumbent posture, lying on his back, either on a sofa, or on the edge of a bed, with his feet supported by two chairs. In the former case the surgeon will be on one side, and in the latter he will be immediately in front of the patient. A bolster or thick cushion should be placed under the pelvis so as to keep the neck of the bladder somewhat elevated. A silver catheter is then to be introduced into the bladder, through which, by means of a syringe, such a quantity of tepid water should be injected as can be easily borne. The catheter used for this purpose should be provided with a stopcock, and the extremity of it should not be prolonged a great deal beyond the curvature. It may then be used, not only as a catheter, but also as a sound, for the purpose of exploring the bladder, and ascertaining in what part of the bladder the calculus is, at that time, lodged. This knowledge is always useful, but it is by no means indispensable; and I have often been able to seize a small stone with the forceps which I had not been able to detect by other methods previously. The injection of the bladder having been completed the catheter is to be withdrawn, and the lithotrity-forceps is to be introduced in its place. In consequence of the peculiar shape of the latter this is less easily accomplished than the introduction of the catheter. The mere depression of the handle is not always sufficient to make it enter the bladder; and it is often necessary at the same time to apply a moderate but steady force during the time that the curved part of the instrument is passing through the neck of the bladder. This is especially the case where the prostate gland is in any degree enlarged. You will know when the instrument has fairly entered the bladder by the facility with which you can move it any direction, and by your being able to open the bladder to any extent without giving the patient pain. You may then explore the bladder with the forceps, and endeavor to ascertain the exact situation of the calculus in it. If it be lying on one side, by opening the blades and then gently and cautiously turning them towards it, you will probably be enabled to seize it. If you do not succeed by this method, by the following you will rarely fail.

Raise the handle of the forceps so as to bring the convexity of the fixed blade in contact with the posterior part of the bladder; then open the movable blade, at the same time making a moderate pressure downwards in such a manner as to depress the bladder towards the rectum. The instrument being then gently shaken by a lateral motion of the hand the calculus, in whatever part of the bladder it may be situated, will roll between the blades and will be seized by closing them. Having been thus carefully secured, by turning the screw it is broken into fragments. The whole of this is a very simple process, requiring but little practice to make you a perfect master of it. When the calculus has been once broken, the fragments are to be seized and crushed in the same manner. They will fall one after another into the grasp of the forceps; and there is no limit to the number that may be crushed at one time, except what is afforded by the diameter of the urethra. Every fragment that is crushed adds

to the accumulation of calculous matter; and if the accumulation be very large, it becomes difficult, or impossible, to withdraw the instrument without injury to the membrane of that canal. The marks on the handle of the instrument inform you of the exact extent to which the blades are separated; and you must use your own discretion, founded on your knowledge of the size of the urethra, as to the point at which you should stop. The forceps first used being then withdrawn, you may use a second, and even a third, in the same manner; and thus you may not only crush a great number of fragments at one operation, but you may remove from the bladder a great deal of what has been crushed.

I have said that, lest the urethra should be injured in this part of the operation, you are to be careful to withdraw the forceps before the blades are too much separated from each other by the calculous matter collected between them. With the same view you should withdraw it slowly and gently, as it is better that the urethra should be forcibly stretched, or bruised, or lacerated.

The directions which I have just given will apply to all cases in which the calculus is of moderate dimensions. But when you have reason to believe that it is of larger size it will be more prudent to use, in the first instance, the lithotrity-forceps which I have already described as having a longitudinal slit in the fixed blade, and a corresponding wedge-like projection in the movable blade. I believe that there is scarcely any calculus, however large, which will not yield to the pressure of this instrument. It is true that it will simply break it into fragments, and that none of the latter will be brought away between the blades. But it is required only in the first instance, and the common forceps, which answers both purposes, may be used afterwards.

When as much has been done as you think can be done with prudence at one operation, the catheter should be again introduced, and the bladder emptied of the water which it contains. Another syringefull of water may then be injected, which the patient may be left to void by his own efforts, or which may be drawn off by means of a large catheter, with two appertures near the extremity of sufficient size to allow some of the smaller fragments to escape through them.

I have heard of a patient being allowed to walk about as usual immediately after the operation. But I am satisfied that this is a most unsafe and imprudent practice, and that it is much wiser to insist on his remaining quiet on a sofa or in bed. It is often prudent to administer a dose of opium afterwards; and at any rate this should always be done when the forceps has had a good deal of calculous matter accumulated in it, so that the urethra must have been forcibly dilated during their extraction. Such forcible dilatation or stretching of the urethra is in the greater number of instances followed by a rigor; and a dose of opium administered after the operation will seldom fail to prevent this ill consequence. An aperient pill composed of the compound extract of colocynth, combined with the *pilula hydrargyri*, may be administered in the evening, with a view to counteract the in-

fluence of the opium in stopping the action of the bowels and the secretion of the liver.

It is necessary that you should watch the patient afterwards, lest he should suffer from retention of urine, produced by the lodgment of some of the remains of the calculus in the urethra, and which might render the introduction of a small catheter necessary. But this is an inconvenience which very rarely occurs, where the patient remains in a state of repose after the operation; and, indeed, it is remarkable, that the fragments left in the bladder often do not seem to find their way into the urethra for the first day or two after the calculus has been crushed. From this period they begin to pass away with the urine; and the patient should be desired to collect and preserve them, in order that you may be enabled to form some kind of opinion as to the bulk of the calculus which has been broken down. For the most part the escape of the fragments takes place without difficulty, and with little inconvenience to the patient. I never met with but two instances in my own practice, in which the lodgment of them in the urethra was productive of any real harm, and of these I shall give you an account hereafter.

Where a calculus is of small size, and there is no unusual irritability of the bladder, a single operation is often sufficient for the patient's cure. In less favorable cases it may be necessary to repeat it several times. The intervals between the respective operations must vary according to circumstances; the only rule that can be laid down being, that the operation should never be repeated until the patient has recovered from the effects of what had been done previously, and that it should not be delayed long afterwards.

It is, of course, of essential importance that every portion of the calculus should find its way out of the bladder; and a principal objection made to this operation has been, that the smallest fragment, if it so happens that it has been left behind, will occasion a recurrence of the disease. To prevent so great an evil it is necessary that you should explore the bladder carefully, not only with the sound, but with the forceps, at least twice after you have had reason to believe that the cure was complete; and with this precaution, according to my experience, in cases in which the patient is able to empty the bladder by his own efforts, the chance of a fragment remaining to form the nucleus of a future calculus is so small that it need not enter into your calculations. But it is quite otherwise in those cases in which the patient, in consequence of an enlargement of the prostate gland, is unable to empty the bladder by his own efforts. Hence only a small portion of the crushed calculus will come away in the stream of urine, and you must be satisfied with washing out the remainder of it through the catheter by repeated injections of tepid water. Mr. Weiss has invented a forceps which, when the blades are opened in the bladder, answers at the same time the purpose of a catheter, and this is often very useful; still on ordinary occasions you will find nothing to answer the purpose better than a silver catheter of as large a size as the urethra, with two very large apertures near the closed ex-

tremity, not placed laterally, as in ordinary catheters, but one on the anterior or concave, and the other on the posterior or convex surface. It may indeed be said, that, in the case now referred to, this kind of operation ought not to be recommended. But it will sometimes happen, that although the patient may have had no difficulty of emptying the bladder before the operation, the prostate may be rendered tumid in consequence of its being irritated by the repeated introduction of instruments, so that he is unable to empty the bladder afterwards. Besides, although this state of things adds to the difficulty of the operation, it is not in itself sufficient to prevent it being brought to a successful termination; and in cases in which there is good reason to believe that the calculus is of a small size, it forms no objection to it.

The effects of a surgical operation are seldom merely negative; and a prudent surgeon before he undertakes it will feel that it is his duty to look, not merely at the favorable, but also at the unfavorable results, by which it may be followed. We can by no other means form a just estimate of what the operation is really worth, and in this, as in all other cases, the first step towards avoiding a threatened evil, is to know what the evil really is, and what are the peculiar circumstances to which its existence may be traced.

It may be said, that hæmorrhage is one of the inconveniences attendant on the operation of lythotrity. It may arise from the forcible introduction of the lithotrity-forceps through the neck of the bladder, where the prostate gland is somewhat enlarged ; or, from the dilatation of the prostate and urethra in the act of withdrawing the forceps, when the blades are charged with a considerable accumulation of the crushed calculous matter. The loss of blood, for the most part, does not amount to more than a few drops ; but in some instances I have known it to be sufficient to discolor the urine for one or two days afterwards. In a former Lecture I have referred to certain cases of enlarged prostate, in which the vessels of that gland are so turgid with blood as to be liable to bleed profusely, even on the introduction of a catheter, and I conclude that, in such cases, considerable hæmorrhage would also follow the use of the lithotry-forceps. They must, however, be of rare occurrence, as I have met with no instances in which hæmorrhage has taken place to such an extent as to interfere with the complete performance of the operation.

The occurrence of rigors is another ill consequence of lithotrity in some instances. I have already mentioned that a rigor is usually produced by the stretching of the urethra at the time of the forceps being withdrawn from the bladder, and that in most instances, it may be prevented by the exhibition of a dose of opium immediately after the operation. This symptom may, however, arise from other causes; as, for example, from a fragment of calculus finding its way into the urethra, which is too large to be expelled by the pressure of the stream of urine ; and it sometimes happens that the effect of a dose of opium is, not to prevent the rigor altogether, but to cause it to be deferred until the following day. The liability to rigors, however,

where due precautions are used, is seldom such as to interfere in any great degree with the process necessary for the patient's cure, and his ultimate recovery; and I never met with a case in which it could be said to have done so, unless, indeed, we suppose it to have exercised an unfavorable influence, by hastening the progress of disease of a kidney, in a case, the particulars of which I shall have occasion to mention before this Lecture is concluded.

I have already referred to two cases in which there is reason to believe that a fragment of a calculus impacted in the membrane of the urethra had been concerned in producing an urinous abscess of the perineum. In each of these there was a good deal of pain, and constitutional disturbance, until the abscess was opened, and this being done, the symptoms were immediately relieved. The first of these patients labored under symptoms of rental disease, under which he gradually sunk, and died at the end of about two months after the abscess was opened; a tumor having some time before his death presented itself in the abdomen, which I believe to have had its seat in one of the kidneys, though I had not the opportunity of ascertaining the fact by a *post-mortem* examination. In the other case, the opening in the perineum healed, under very simple treatment, and the patient was soon restored to health. The rule of practice which applies to other abscesses in the perineum applies to these also. They cannot be opened at a two early period, and they become dangerous when this operation is delayed.

In some instances the patient complains of pain referred to the whole canal of the urethra, in consequence of a considerable number of fragments escaping at the same time. In others, he experiences much irritation of the bladder, and an incessant desire to void his urine, apparently produced by a fragment remaining for some time lodged in the urethra, close to the neck of the bladder. It is evident that the lodgment of a large portion of a calculus, or an accumulation of small ones in any part of the urethra, may occasion an absolute retention of urine. This is, however, a rare occurrence, as I have not met with it, except where it lasted only for a limited period of time, in my own practice. Of course, a diminution, and often a great diminution, of the stream of urine is always to be looked for, while the fragments are coming away, and the involuntary straining to make water, which this occasions, is a principal agent in the final expulsion of them from the urethra.

With a view to promote the escape of the fragments, by increasing the flow the of urine, the patient may be directed to drink plentifully of barley water and other diluting liquors. Where any kind of inconvenience arises from the retention of the fragments in the urethra, a catheter, of a middle size, may be introduced carefully into the bladder. In some cases it will, by making even a slight alteration in their position, enable them to come away easily, though they seemed to be almost immovable before. In other cases it may push them back into the bladder, to be more minutely crushed at the next operation. I have sometimes given the patient relief by extract-

ing portions of a calculus which lay in the anterior part of the urethra, with a long slender forceps, and I suppose that cases may occur, in which a fragment may be so completely impacted in the urethra, as to make it necessary to make an incision in the perineum or penis for its removal. I have not, however, ever had occasion to resort to this expedient in my own practice.

But in all cases prevention is better than cure, and the means of preventing the evils which have been just described are very much in our own power, and in that of our patients. A state of perfect repose, in the recumbent posture, except when it is necessary to remove from one room to another, should be considered as indispensable after the operation, and I venture to say, that where this rule is observed, it will very seldom happen that the passage of the fragments along the urethra is productive of any serious inconvenience.

Inflammation of the mucous membrane of the bladder, indicated by a deposit of adhesive mucus from the urine, and a too frequent micturition, with more or less of a febrile excitement of the system, is sometimes an immediate result of the operation, subsiding spontaneously in the course of two or three days. Occasionally it seems to be connected with the lodgment of some fragments of the calculus in the neck of the bladder, and continues until they are removed from that situation, either by passing forwards along the urethra, or by being pushed backwards into the bladder by the catheter. Several years ago I was called to see a case in consultation, in which, after the breaking of a calculus, severe inflammation of the bladder followed, continuing, in spite of all remedies employed, until, at the end of three or four weeks, it terminated in the patient's death. The calculus, in this case, had been of a very large size, and the numerous fragments into which it had been divided might reasonably be supposed to have been an abundant source of irritation. But, in addition to this, I have good reason to believe, that the patient had not remained in that state of complete repose, which, for other reasons, I have already recommended, and which seems to be, on every account, necessary to his security after the operation.

It is due to you, that you should be made acquainted with the unfavorable circumstances which may attend on this mode of treatment; but you are not to suppose that it often happens that these exist to any considerable extent, or that the probability of their occurrence is sufficient to counterbalance the great advantages which the new operation often presents over that of lithotomy. It would be a great error to represent it as preferable on all occasions; but it is so in a great many instances; and I shall next endeavor, as a guide for your future practice, to explain by what signs you may distinguish from each other the cases to which it is applicable, and those to which it is not.

In boys under the age of puberty lithotomy is so simple, and so generally successful, that we ought to hesitate before we abandon it for any other kind of operation.

There is also a manifest objection to lithotrity in these cases, on account of the small size of the urethra, which is such that it would

not admit of the introduction of instruments of sufficient strength to crush a calculus of more than moderate dimensions.

In the female sex, the extraction of calculus from the bladder by the ordinary methods is attended with little danger; while the operation of crushing it is rendered difficult, in consequence of the short and wide urethra allowing the water which has been injected into the bladder to escape by the side of the lithotrity-forceps before the operation is completed.

In cases in which the calculus has attained a very large size, it is often difficult to seize it with the lithotrity-forceps; the operation of crushing requires to be repeated a great number of times, so that many weeks may elapse before the cure is accomplished; a larger quantity of fragments is left in the bladder, of which the necessary consequence is a great liability to inflammation of the mucous membrane; and of course the inconvenience produced by the passage of the fragments along the urethra is multiplied as compared with what happens when the calculus is smaller. These circumstances form a sufficient objection to the operation of lithotrity in those cases. It is true, that there are unfavorable cases for lithotomy also; but I have little doubt that the latter method is the safer of the two. It admits of a question, whether, in such cases, the two modes of operating may not be advantageously combined, the calculus being crushed into three or four pieces first, and extracted by the usual incision afterwards. The operation of lithotrity, as I have already observed, is not well adapted to those cases of enlargement of the prostate gland, in which the patient is enabled to empty the bladder by his own efforts, unless the calculus be of a small size, so that there may be no great difficulty in washing the minute fragments, into which it has been crushed, out of the bladder through a large catheter.

There is also another objection to the operation in some cases of enlargement of the prostate, namely, that the tumor which projects from it into the cavity of the bladder, makes it difficult to elevate the handle of the forceps sufficiently to seize the stone easily in the usual manner.

I have described the dangers which attend on lithotomy in those cases in which a calculus of the bladder is complicated with disease of the kidney. One of the principal of these is connected with the loss of blood, which that operation must always occasion to some extent, and not unfrequently to a great extent, in spite of the best exertions of the surgeons to prevent it. I have no doubt that, in such cases, the operation of crushing is the safest method of proceeding; but a small shock to the system will sometimes destroy the life of a patient who labors under renal disease, and it will be often more prudent to trust to the means which we possess of palliating his sufferings, than to run the risk of shortening his life in the endeavor to obtain a cure. The case which I am about to describe is, in many respects, interesting, and especially so as it serves to illustrate the ill consequences which may follow even a trifling operation, where there is a considerable disease of the kidney.

A gentleman consulted me in the year 1836 on account of calculi in the bladder. Six months previously he had been placed under circumstances which compelled him to retain his urine for an unusual length of time, and he experienced great distress in consequence. From that period he had suffered more or less from pain in the loins, to which the usual symptoms of calculi of the bladder were superadded afterwards. He presented no appearance of ill health otherwise. Having injected the bladder with tepid water in the usual manner, I seized two very small stones with the lithotrity-forceps, and crushed them, extracting nearly the whole of the fragments between the blades of the instrument. All this was accomplished without the smallest delay or difficulty; but the patient was seized with a rigor afterwards. At the end of about forty-eight hours he was suddenly attacked by a most severe and agonising pain referred to the loins, which could only be mitigated by a large dose of opium. In the course of a few hours the pain had subsided, and the pulse, which had been very frequent while the pain lasted, was reduced to the ordinary standard. After two days more he had another similar attack, which subsided like the former one, leaving him apparently perfectly recovered. Subsequently he had many other attacks of the same kind, lasting for a longer time, and recurring at shorter intervals, one of them being preceded by a severe rigor. The pulse now remained always increased in frequency, the skin was hot, delirium alternated with drowsiness, and the patient gradually sunk, and died on the tenth day after the operation. On examining the body, the bladder was found in a perfectly healthy state, except that it contained four small calculi, not larger than horse-beans, which, if the patient had survived, would have been easily crushed by another operation. The right kidney was very little altered from its natural condition. The left kidney was of double the ordinary size. The investing membrane adhered more closely to the surrounding adeps than to the kidney itself, and when it was removed the surface of the kidney presented a mottled appearance, in consequence of a great number of depositions of straw-colored lymph in its substance. The membrane of the *infundibula* and *pelvis* was inflamed, and these cavities contained a considerable quantity of dark-colored muco-purulent fluid.

With the exception of such cases as those which have been enumerated, there are few to which this method of treatment may not be advantageously applied. It may be said that the exceptions are numerous; but they are the result chiefly of delay. If a patient seeks the assistance of a competent surgeon within six or even twelve months after a calculus has descended from the kidney into the bladder, the urine having remained acid, it will rarely happen that he may not obtain a cure by a single operation, and with so small an amount of danger that it need scarcely enter into his calculations. As time advances,

the facility with which he can be relieved diminishes, and after the lapse of two or three years, especially if the urine has become alkaline, it is probable that the calculus will have attained such a size as to render the old operation preferable, and that the access of disease in the bladder or kidneys may render any operation hazardous. It would be absurd to say, and it would be unreasonable of human-kind to expect, that an operation which has for its object to relieve them of a disease so terrible as that of a stone in the bladder, can be always free from inconvenience, and difficulty and danger. Nevertheless, from what experience I have had, I am satisfied that the operation of lithotrity, if had recourse to only in proper cases, is not only much more successful than that of lithotomy, but that it is liable to fewer objections than almost any other of the principal operations of surgery.

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Plates 11 and 12.—Surgical Dissection of the Axillary and Brachial Regions, displaying the relative order of their contained parts.
Plates 13 and 14.—Surgical Form of the Male and Female Axillæ compared.
Plates 15 and 16.—Surgical Dissection of the Bend of the Elbow and the Forearm, showing the Relative Position of the Arteries, Veins, Nerves, &c.

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Plates 17, 18 and 19.—Surgical Dissections of the Wrist and Hand.
Plates 20 and 21.—Relative Position of the Cranial, Nasal, Oral, and Pharyngeal Cavities, &c.
Plate 22.—Relative Position of the Superficial Organs of the Thorax and Abdomen.
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